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HUNTERIAN REMINISCENCES;

BEING THE

SUBSTANCE OF A COURSE OF LECTURES

DELIVERED BY

MR. JOHN HUNTER,

IN THE YEAR 1785.

COMPTON & RITCHIE, PRINTERS, MIDDLE STREET, CLOTH FAIR, LONDON.

HUNTERIAN REMINISCENCES;

BEING THE SUBSTANCE OF A

COURSE OF LECTURES

ON THE

PRINCIPLES AND PRACTICE OF SURGERY,

DELIVERED BY THE LATE

MR. JOHN HUNTER,

IN THE YEAR 1785:

TAKEN IN SHORT-HAND, AND AFTERWARDS FAIRLY TRANSCRIBED, BY THE LATE

MR. JAMES PARKINSON,

AUTHOR OF "ORGANIC REMAINS OF A FORMER WORLD," &c.

EDITED BY HIS SON,

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FELLOW OF THE ROYAL COLLEGE OF SURGEONS, IN LONDON;

BY WHOM ARE APPENDED

ILLUSTRATIVE NOTES.

LONDON:

SHERWOOD, GILBERT, AND PIPER, PATERNOSTER ROW.

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FORMERLY THE ZEALOUS AND DILLIGENT ASSISTANT OF THE LATE

MR. JOHN HUNTER,

NOW THE ABLE CONSERVATOR AND INTELLIGENT ILLUSTRATOR

OF THE

Hunterian Museum,

THIS WORK IS INSCRIBED,

BY

THE EDITOR.

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PREFACE.

TO those gentlemen who have been partly instrumental, by their solicitations, to the production of this work, and who are aware of the motives which induced the Editor to present it to his medical brethren, any preface or introduction may appear uncalled for, if not superfluous. But by those who have the good fortune to be now commencing the study of their profession under the direction of the enlightened professors of the present day, not only in every branch of medicine, but in every science associated with it, a few prefatory observations may be deemed requisite; for to them the necessity or utility of publishing the substance of lectures delivered half a century ago, may not be very apparent.

Nor is the absolute necessity or utility contended for:—no more would it be necessary to examine the foundation of a building, every part of whose superstructure bespeaks its stability; yet it is pleasing, nay, highly interesting, occasionally to descend from the height to which modern surgery has attained, and carefully retrace each step, until we arrive at the very base on which it rests, every stone of which may be said to be inscribed with the name of JOHN HUNTER; for not only did he supply the materials, and work them with his own hands; but, if proof were wanting of how much he left wherewith to adorn the superstructure, let us visit the far-famed Hunterian Museum, where we may take our stand, and exultingly exclaim,

"Si monumentum quæras circumspice."

To him may be justly applied what the Reverend Dr. Chalmers has said of Sir Isaac Newton, when speaking of the means by which he arrived at the sublime truths of astronomy:—" It was by the patient, the strenuous, the unfaltering application of the legitimate instruments of discovery; it was by touching that which was tangible, and looking to that which is visible; and, in one word, by making a right and reasonable use of all that proof which the field of nature around us has brought within the limit of sensible observation."

That Mr. Hunter was gifted with a penetrating genius cannot be doubted; but he possessed qualifications to which surgical science was far more indebted,—a great talent for observation and reflection, united to the most persevering industry. Unrestrained genius, when employed in the investigation of natural objects and phenomena, is too apt to catch at the most distant, inconstant, and oftentimes most fanciful relations of objects and ideas; but when under the wholesome controul imposed upon it by a patient interrogation of nature conducted upon the principle of close and careful induction, then the most constant and useful relations are presented to the mind and in the best order, and often relations and dependencies foretold which subsequent investigations have proved to exist; hence it is that the fame of a man in possession of such a genius far outlives his exit from this world.

It is for these qualifications that Mr. Hunter should be held up as the bright exemplar to the young aspirant for surgical fame, ever to be kept in his mind's eye, and closely followed, that he may early acquire the habit of observing and reflecting for himself, and be taught the important lesson upon which his future success in life mainly depends,—that of not pursuing the noble and useful profession of which he is desirous of becoming a member with a view only to its emolument, but always to keep a steady and zealous eye to its advancement; for he may be assured that the degree of ardour

which he displays in this respect, will be the measure by which a discerning and enlightened public will judge of the confidence to be placed in him.

Mr. Hunter sought not for applause by performing a surgical operation, were it ever so difficult of performance, or happy in its result ; he sought not for applause for the cure of a disease, the nature, and consequently the principles of treatment of which had eluded the scrutiny of his research ; but he sought for applause whence only it was worth receiving,—from the voice of science and philanthropy ; from the former, for philosophically unravelling, as it were, the true principles of his profession ; from the latter, for the humane and ingenious application of those principles to the alleviation of human suffering.

The Editor is very far from considering these "Reminiscences" as constituting a system of surgery ; they must rather be regarded as consisting of fragments (and those often very unconnected), but containing most of Mr. Hunter's original pathological doctrines. Nor can he flatter himself that the work is totally free from errors arising from occasional misconception of the Lecturer's meaning ; and he is also ready to allow, that there exist in it many obscure passages, the necessary consequence of the acknowledged difficulty that Mr. Hunter had in always making himself understood by his auditors, his powers of language being often too inadequate to embody the magnitude of his conceptions.

The Editor is aware that he might, in some measure, have removed this obscurity by a reference to Mr. Hunter's published works ; but as the lectures were attended by his Father (who was at that time in practice), with the view of selecting those pathological doctrines which were exclusively Mr. Hunter's, and of conveying them as precisely as possible in his own words, he felt that to make any material alteration in the genuine expression of the notes, and so to affect their sense, would be a violation both of the

sacred memory of that great man, and of his much-lamented amiable Father, to which he could neither bring his heart to consent, nor his hand to perpetrate.

With all its faults, for many of which the Editor holds himself personally accountable, he trusts the work will, in some measure, supply the loss which surgical science has sustained by the destruction (by accident it is to be hoped) of the original notes from which Mr. Hunter lectured. With this view alone does he deliver it into the hands of a learned and liberal profession, to be dealt with according to its merits.

*** That no undue importance may be attached to the appended Notes, the Editor begs to state, that they consist principally of reflections made during the preparation of this work for the press, assisted by his own previous observation and reading. As he is desirous of chiefly addressing them to the tyro in the profession, he trusts he shall be excused for the familiarity of the style and illustrations he has employed.

HUNTERIAN REMINISCENCES;

BEING THE

SUBSTANCE OF A COURSE OF LECTURES DELIVERED BY THE LATE MR. JOHN HUNTER IN THE YEAR 1785.

ANIMAL AND VEGETABLE MATTER.

IT was customary with Mr. Hunter to commence this course of Lectures by taking a general view of the properties of matter, enumerating those common to all matter, and those peculiar to animal and vegetable matter; the two last, he observed, possessed properties which common matter did not; and are such modifications of common matter as to differ from it in many instances; or they may be said to have a principle added to them, out of which new properties arise. They not only differ from common matter, but in many respects from each other; but they both possess an action within themselves, and a power of deriving a supply of their own particular matter from other substances. Animal matter can only be supplied by vegetable matter, or by matter of the same nature with itself. Vegetables seem to derive their supply not only from matter of their own nature, and from animal matter, but likewise from common matter: they are both capable of reproducing their kind. Both animals and vegetables may be either in a dead or a living state: they may possess the living principle; or, being deprived of it, may have returned to common matter; which may be assumed as a proof of their having originated from common matter.

Mr. Hunter must now be considered as speaking in his own person.

FERMENTATION.

By fermentation, I should expect to be meant, such an action as shall produce such an alteration in the arrangement of the particles of the matter acted upon as entirely to alter its nature, thus converting vegetables into wine, and that again into vinegar: whereas, in the secretions of vegetables or animals, their peculiar natures, vegetable or animal, is still preserved. But I cannot think that any thing of this kind takes place in either a living animal or vegetable. Fermentation appears to be a process peculiar to dead vegetable or animal matter; and where we find a tendency to fermentation, we may conclude that there is a defect of the living principle.

There are many effects which may look like chemical operations, such as the forma-

tion of sugar in plants, &c., the digestion of food, &c. in animals ; but these, for the reasons just stated, cannot be the result of chemical action ; but are the consequence of the particular action of animal or vegetable matter, actuated by the principle of life. Having dismissed chemical causes, we may also venture to assert, that the first cause of action in animals is not mechanical ; but we can allow mechanical causes, as secondary causes, facilitating the action produced by the *living principle*, which certainly is the first cause of action in animal or vegetable matter.

Although the same observations will, in a great measure, apply to vegetables, yet we shall now confine ourselves to the consideration of animal matter endowed with the living principle.

LIFE.

Animal matter, then, is the result of a peculiar combination of other matter ; and this combination or modification of common matter may be endowed with the living principle or not, the living principle not depending on that modification of matter which renders it animal matter ; for this modification, which is peculiar to animal matter, and which constitutes it, may remain when the living principle is gone. Life is, therefore, something superadded to matter thus modified, or it is such an arrangement of the most minute particles of this modification as life may arise out of it, which arrangement may be the principle of life ; and if this arrangement be destroyed, the principle of life is also destroyed, and the part becomes dead animal matter ; and though it has suffered this alteration in its arrangement, and the loss of this principle, yet its modification, as far as our senses can discover, remains the same. This idea of life is hard to be illustrated : but magnetism, perhaps, affords the best illustration of it, for iron not magnetized may be considered as animal matter not endowed with life, and, when possessing the magnetic power, may be compared to animal matter possessing the vital principle : now in neither of these can we discover by our senses, even when aided by art, any alteration in their modification when possessing or when without this principle. Light may, by its effects on bodies, yield us another illustration of this idea. This principle of life is the preserving principle of the animal, from its being the first cause of those actions whereby it is supported and continued. It is not sufficient that animal matter should be endowed with a principle of preservation ; it must have action within itself : and the same arrangement which constitutes the principle of life does also constitute the principle of action ; the *power of action* is, indeed, a step further. The most minute form possessing this necessary arrangement which our eyes can trace, is the simple living fibre, whence is formed muscular fibres, muscles, organs, &c. There is this principle of action everywhere where there is life, for action is not confined to the muscles. Life I believe to exist in every part of an animal body, and to render it susceptible of impressions which excite action.

This principle of action has been compared to the spring of a watch, but this comparison will not suit, since, in a watch, the spring alone possesses the principle of action,

and is the immediate cause of action; and the action of all the other parts is entirely dependent on the impulses they receive from it: but in the animal machine every one will see that the principle of action resides in every part, so that although action may be excited through the whole animal by impulses from one part to the other, yet the principle of action is inherent in each of these parts, and independent of that of the others.

The first and most simple idea of life is, its being a principle of self-preservation; the second is, its being a principle of action. The first of these may be conceived to exist without the other: it is not necessary that there should be action where we suppose the other principle to be. A fresh egg has no action, but is as much alive as a muscle; as a proof of which, let us observe, that when an egg is nearly hatched, the yolk is entirely sweet, as well as the albumen, notwithstanding the long heat it had been exposed to; but if it does not hatch, it becomes putrid. And further: *Exp.* 1. A fresh egg was frozen, thawed again, and then exposed to the same degree of temperature (about the freezing point) with an entire fresh egg; and this latter, which had not been previously frozen and thawed, was six or seven minutes later in freezing than the former. This is to be accounted for by supposing, that the former having been deprived of its vital principle by the previous freezing, froze soon after its exposure to a degree of heat sufficiently low; but that the other egg, possessing the vital principle, resisted freezing until deprived of that principle.—*Exp.* 2. An egg, likewise, which had been frozen, and then thawed, was frozen again in much less time than at first.—*Exp.* 3. A fresh egg, and the egg which had been frozen, were put into a freezing mixture, at 15°, and a thermometer was placed in each: the heat of the dead egg came regularly down to 32°, where it directly froze, whereas the live egg came down to 29¼°, where it remained fluid, and then rose again to 32°, where it directly froze. This is to be observed, that freezing may be prevented by many circumstances, and in this case by the presence of the living principle; and where this happens the fluid will contain heat some degrees below the freezing point, and remain fluid until those particular circumstances no longer act, when it directly freezes, which happens in the present case until the living principle is destroyed.

With respect to the principle of action, it is necessary that action should continue in some parts for the preservation even of the principle of action; but in other parts it is only necessary that the principle and power of action should remain, action itself not being in those parts constantly necessary.

The living principle, we have before observed, is the principle of self-preservation in the animal, preserving it from putrefaction, which state soon comes on when life ceases, but much sooner in some instances than in others, appearing sometimes even before the departure of life: this last we may suppose is the consequence of a morbid or depraved action of the living principle, by which a putrefactive action takes place before death; but it is not certain whether in putrid fever, and even in the other instances, whether this alteration is not owing to some defect in the modification of the parts of the blood, and not a real putrefaction of the blood, which immediately before possessed their natural

modification ; at least, this process is different from the putrefactive process which takes place after death : nay, this very putrefaction being a part of the disease, the result of a morbid action, this process ceases when the actions of the animal are put a stop to by death, and then putrefaction, or the resolution of animal matter to common matter, begins to take place ; so that we may say, that there are two kinds of putrefaction which may take place in animal matter ; and it is observed, that the latter putrefaction, after the death of such animals as have had this former process begun in them, has not proceeded faster on that account. I may here state, that I have seen two or three cases where this process had taken place before death, the cellular membrane being emphysematous with air thereby extricated, nor did the succeeding process of putrefaction appear to be so much quickened thereby as might have been expected. In the case of a man who had suffered the operation for aneurism of the popliteal artery, the leg, from about the middle of the calf downwards, became entirely cold, pale, and insensible, and was in every respect really dead, not being mortified, which is the consequence of a morbid action, but had, as it were, really died a natural death from having no blood sent into it. A few days after this the man complained of being unwell, and in a few hours there were evident appearances of a resolution, or, if you please, a putrefaction through the whole living system, emphysema, opening of the cicatrix of the artery, &c. ; but the leg, from the calf, suffered little or no alteration ; and after the man's death it was put into the same degree of heat with the other leg.

Death acts as a stimulus on the whole body, so that every part contracts ; and by this contraction of every part putrefaction is with more difficulty begun and carried on. Putrefaction comes on sooner in those who have died suddenly than in those who have been longer exposed to the stimulus of dying.

THE BLOOD.

The blood has been supposed to be a passive inanimate body, deriving its motion from the action of the heart. Some, in considering this fluid, have only attended to its changes out of the circulation ; others to its chemical analysis ; and others to its appearance in the microscope : but its chemical analysis and form explain nothing.

Blood is not simply animal matter, but possesses that arrangement on which the living principle depends, and thereby differs from dead animal jelly. Whatever is taken into the system for supply must undergo these changes : first, Animalization, or such a combination, the result of which is animal matter ; and secondly, Vivification, or such an arrangement of its particles on which life depends. By these actions even vegetable substances are converted into animal matter, and also receive the living principle. Dead animal matter also suffers, with vegetable, an entire change,—is, as it were, again animalized, and then receives also the living principle. What is produced from vegetable as well as animal matter appears to be the same ; and as they are both exposed to the same action, it is reasonable to conclude they both undergo a similar change,

and that the animal matter, as well as the vegetable, suffers animalization. Vivification cannot exist prior to animalization; but we can easily suppose the latter without the former. Animalization begins in the stomach, and is called digestion; and the result of this process is chyle. The matter undergoes three changes: first, that of food into chyle; secondly, that of chyle into blood; thirdly, the blood into solid parts. The blood, I think, receives the living principle in the first stage, *i. e.* when the food is converted into chyle; others have thought it received it in its passage through the lungs; and some when it is converted into a solid. Fluidity is not exempted from this principle. Organization is not necessary for life, but for action. The blood I conclude to be alive, as it carries life to every part of the body; it therefore must itself possess it: it is the only first cause of life. Nerves are not the first cause, as they require the blood to support them alive. It is always found in a fluid state in the healthy vessel; solidity is contrary to its nature. The celerity of its motion is not the cause of its not coagulating, as in some of the veins it passes so slowly as almost to stagnate; nor does the indisposition to coagulate arise from any property it possesses as mere animal matter, but from its being animal matter so arranged as to possess the living principle, the result of that arrangement. There is a kind of consciousness, or harmony, existing between the blood and solids, but particularly in the vessels. A very small quantity of blood will preserve this harmony; the introduction of dead animal matter destroys it, and acts as other heterogeneous particles. Besides, the blood is doubtless capable of being diseased as well as the solids; and diseases of the solids act on the blood, and those of the blood on those of the solids; and I can conceive the death of the blood independent of that of the solids: but this, I suppose, must soon follow.

The blood, when at rest, has a disposition to separate, the red particles and the coagulable lymph forming a mass from which the serum is squeezed out. This property of the blood deserves particular attention, and throws much more light on the subjects of our inquiries than may be thought. It is by this change that the solids are formed. The power of coagulation is greatest when out of the circulation, and when exposed to the air. The necessity and usefulness of this property is evident; for it is by this process that a check is often given to extravasation. The crural artery of a boar being divided, the bleeding ceased before the animal seemed weak; and, upon examination, this effect appeared to have been produced by a quantity of firm coagulated blood, which had not only outwardly closed the orifice, but within had regularly and conically contracted the diameter of the canal. By this property it is that wounds are united externally, by which the internal parts of wounds are secured from the air, and the principle of life is preserved, whereby they become united by the first intention. In inflammations this disposition to coagulate is greater; and if the inflammatory disposition is considerable the disposition to coagulate is general: but if the inflammation is local, and the system is not affected, this disposition to coagulation is not universal. Suppose I bleed a person in a symptomatic fever, I can tell directly whether it will be sizy or not, by observing how quickly the red particles attract each other, and by its assuming a mottled appearance from the same cause, when spread on a white surface. With respect to local

inflammations, where the system is not affected, the blood may doubtless become inflamed by passing through the inflamed part; but we may conclude that it loses this when it comes in contact with a healthy part. This disposition to coagulate is a sign of the existence of the living principle in the greatest degree and greatest power. There are many cases of contusions where the blood will be extravasated, so as to be contained in a bag: here the blood remains fluid, for no good effect could be had from its coagulation. This coagulation is one of the effects of the life of the blood; it is an action of the blood within itself; it is a kind of spontaneous generation; it is the first step towards the formation of a fibre; and it is a proof of most of the arguments respecting the life of the blood.

A man was tapped for an hydrocele, without any particular appearance; the serum discharged was clear, but the testicle seemed to be too large; the wound healed, but the tunica vaginalis soon filled again, when an incision was made through its whole length, with the intention of performing the radical cure, when the testicle being found to be diseased, was extirpated, and on that part of the testicle which was opposite to the first wound or the puncture, a coagulum of blood was found, nearly an inch in length and half an inch in width, and another smaller in the chink, between the testicle and epididymis. The adhesion of the larger coagulum to the testicle was particularly firm; the other was only at one end. Fibres were discovered uniting these coagula to the testicle, and when the testicle was injected it appeared that the injection had reached into each of the coagula, vessels being likewise discovered uniting these with the testicle: the testicle was likewise covered with a coat of coagulable lymph, which, like the coagula, had in many places even become vascular; as also were several small spots on the surface of the testicle, which were supposed to have been merely extravasations: these, as well as the coagula, becoming vascular merely in consequence of their being in contact with living vessels. Why, it may be said, should this happen rather than it be absorbed? Because the want of absorption in the part had been the cause of the previous disease, and therefore this could not be expected, and from the speedy closing of the external wound this blood, which may be supposed to have fallen on this part, was not so entirely deprived of its living principle as not to allow this effect to take place in it; and if this had not taken place nature had no means of ridding the part of this coagulated blood. From the materials with which the blood is composed, and from the presence of the living principle, results a property which the blood possesses, when coagulated, of forming itself into parts similar to those with which it comes in contact, such as bones, muscular flesh, tendons, &c.; so that when extravasated blood does thus come in contact with parts possessing the living principle, and the air is excluded, it first becomes merely vascular, then passes through the necessary changes, until it becomes the same with the part on which it is deposited. In putrid diseases the blood appears to be deficient in its vital principle, whence the disposition to coagulate in the blood is lessened. The blood coagulates and suffers contraction like the solids upon the application of a stimulus; thus in death we find the blood coagulates as the solids become rigid from the stimulus of dying; but in cases where the living principle is taken away

in an instant from the blood, as well as from the other parts of the body before these parts can contract, the living principle not having time to act, no struggles nor exertions taking place, the blood has been in those cases found fluid, and here the death of the blood must have been suddenly produced : several instances may be mentioned in proof of this, particularly of a woman who died in labour ; the gentleman whom the newspapers mentioned to have dropped down dead with passion ; and he who was killed by lightning. In all these neither the blood had coagulated nor the muscles contracted.

Two deer, hunted to death, had died without a struggle, and they afforded the same appearances. In these the living principle was nearly exhausted before dying commenced ; hence no action in dying, and hence the tenderness of the meat from animals hunted to death, their muscles not having contracted in dying. Besides the death of the blood, in common with the other parts, there is a natural action, by which the living principle is taken away at, or immediately before, its extravasation. By this is meant, what takes place in the natural evacuation of the menses in women, which when natural does not coagulate, but when it is morbid it will come away in clots. The relief which follows this discharge is not produced so much by the quantity of blood lost as by the peculiar action of the part. This action in the blood is not spontaneous, but proceeds from its irritability : the blood cannot be supposed to communicate sense, its power being that of simple life ; and the blood is as much alive as the solid parts, only the solid parts have a peculiar structure, in consequence of which they are said to possess

ORGANIZATION.

From what has been said, we may have observed that common matter suffers a decomposition, then is again so combined as to form animal matter, which undergoes such an arrangement of its smallest particles as gives rise to action, or, at least, to the disposition to action within itself, being the result and manifestation of the living principle : this again, by a peculiar modification, becomes rigid, elastic, &c. Solidity, in a certain degree, is necessary to the organs of an animal, therefore their parts are kept close together by their attraction of cohesion.

Now we have gone thus far, let us examine how these materials form an animal. We may now consider them in a mechanical view : examining the parts thus formed, we find each part having its own proper use, forming organs of various kinds, and united according to established rules. Although organization is the result of the living principle, yet it may exist for some time after life has ceased ; for the dead animal is organized as much as the living : organization is, as it were, the mechanical means of producing the effects intended by nature. The ultimate effect of organization is mechanical. Having thus far considered simple life and simple organization, I shall consider

ACTIONS.

The actions of an animal are of two kinds ; first, those which are common to every part, and is alike in every part ; secondly, those which are of whole parts, and which differ in every part, in consequence of the difference of construction. The first of these actions are those on which the existence of these parts themselves depends, and which compose the animal economy respecting itself, tending to support the existence of each single part ; the second kind, or the action of whole parts, and which differ in each part according to the construction : these actions are not produced for the immediate use or necessary support of the parts which perform them, but produce some effects necessary to the harmony of the whole. Action of the vital organs may be suspended, and life continue, as was the case with myself. I had the gout in my feet three successive springs, and missed it on the fourth ; when one day I was attacked with a pain so violent about the pylorus, as I thought, as no position could relieve ; my countenance like that of a corpse. I took thirty drops of laudanum in tincture of rhubarb, and found no relief ; the pain continued, and upon examination I found no pulse, and at times found myself not breathing ; I therefore forced myself to breathe. In this state I continued three-quarters of an hour : this went off gradually in about an hour, and I have had no return of it since. With respect to the kinds of actions above enumerated, they may be illustrated in the actions of a muscle, which possesses, first, those actions which are necessary to its growth or continuance, arising immediately out of the living principle ; secondly, the action by which itself is not benefitted, as it were, but which serves for the motion of some other part : this is its muscular action. There is another kind of action in the machine, a kind of secondary action ; this is that of elastic ligaments : this action depends not on life, as this elasticity is a property of dead matter also. Thus, some parts of the machine are active in various degrees ; others passive, as bones, &c. ; others, again, are for the union of parts, as is the cellular membrane. From all that has been advanced, we may conclude, it is this power of action which constitutes the difference between living vegetables and animals and dead matter.

THE STOMACH.

Every animal must have the means of support to enable it to exist, but especially as it must work out its own magnitude. This part of the animal is thrown into the form of a bag, to retain the substances thrown into it. It is provided with a fluid which possesses the power of converting many vegetable, and all animal substances, into one uniform substance. The stomach in the perfect animal makes a very considerable part in the machine : it may be termed the first part of an animal, never becoming more simple, as the animal does. The stomach makes a difference between animals and vegetables ; it has the power of rendering our food similar with ourselves. The polypus is almost all

stomach. The operation of digestion is, perhaps, as curious as any part of the animal economy. We shall find a great connexion between it and almost all the other parts of the animal. In disease we find the brain seems to be intimately connected with the stomach, and *vice versâ;* and that it has a kind of intelligence of what passes on in the rest of the body, as to repletion and its contrary state, seems to be very evident. The stomach is affected by the injuries of several parts which have no connexion with it in the nourishment of the body. Hurts on the testicles immediately produce sickness; and what is very extraordinary, is, that an injury of a tendon will communicate its effects soon to the stomach, whilst an injury of the muscle to which this same tendon may appertain may not affect the stomach in the least.

ABSORPTION.

An animal body has been considered as an hydraulic machine, because it is, in a great measure, composed of tubes; but this view of it is very unsatisfactory. Absorption, in a living animal, cannot be explained upon the principle of capillary attraction; but must depend upon a peculiar action of

THE ABSORBENTS.

The lymphatics convey the lymph, the lacteals the chyle. The arteries and veins are concerned in the motion of the blood, and the veins were likewise supposed to perform the office of absorption; but this is performed by the absorbent vessels only. The matters that were supposed to be absorbed were, first, extraneous matters; secondly, superabundant fluids; thirdly, diseased parts; fourthly, that of whole parts. Thus far they were supposed to act; but we shall find that they are more extensive in their powers, and are of much greater consequence in the machine. We shall find them become modellers of many parts of the body. They may be viewed in a variety of lights: I might, for instance, consider them, first, as absorbing matter which is no part of the machine; secondly, of parts which constitute part of the machine itself; or they may be considered as externally or internally absorbing. Of the first of these is matter applied to the skin, and chyle to the surface of the stomach, &c.; of the last, are secreted liquors, fat, &c. It may be necessary to remark here, that I do not consider fat, or the earth of bones, as animal matter, as they have neither action within themselves, nor do they possess the living principle. Absorption of foreign matter may be salutary, or productive of disease. The same may be said of the absorption of parts of the machine itself, as when there is a diseased waste of the whole machine, or of any particular part: all which I call interstitial absorption; because it takes place from the interstices of parts. The action of absorbents may be considered as natural or diseased. When this action is natural, they may be considered as modellers of the body, and we may say that no alteration in the size or shape

of the body takes place without the action of absorption: this I call modelling absorption; and, considering them in this light, opens a vast field to our observation; for on my idea a bone cannot be formed without their action: by their action, too, whole parts not wanted in the machine are removed, as the membrane pupillaris, ductus arteriosus, thymus gland, &c. This last property is most remarkable in the changes undergone by a maggot or caterpillar: and here I must observe, that a bone does not grow in all its parts, that is, it does not grow by addition of new particles among those already arranged, or in their interstice, but by the addition of parts lengthways or sideways of the bone. This I proved by exposing the bones of young animals and boring holes in them, which were prevented from being obliterated by fixing pieces of leaden shot in them: these bones were examined a considerable time after, when, although the bones had considerably grown, the holes were exactly at the same distance from each other. I will endeavour to shew in what manner the absorbents act in modelling; and for this purpose will conceive it to be a bone of the thigh. Now, having proved how this matter is added, we will first see what would take place were it not for the action of the absorbents, and then see in what manner they must act to produce the effects; and, first, it is clear that by being added in this manner at the condyles the sides must become too thick in proportion to its length, and at its upper part this would likewise become too thick in proportion to its length; but this irregular effect is prevented by the modelling absorption taking place, the absorbents taking up at the condyles from the sides, whilst matter is applying at the lower end; whilst at the head and neck they are taking off from the circumference, whilst the matter is laying on at the upper end. Ossification has been thought to begin in the form of a ring; but this is a wrong idea, as ossification begins in a knot, and the form of a ring is afterwards effected by the absorption of the inner part; and thus it is that the modelling absorption forms the cavities of cylindrical bones, whilst fresh matter is adding to the external part: hence the absorbents are as much modellers of the body as they are preservers of it; these model what the arteries erect.

Absorption of diseased parts is ulceration; but I do not know a term applicable to the absorption of whole parts, such as the gland thymus. This process, by which whole parts are absorbed, has not been in the least attended to. Fat and earth was known to be liable to absorption, but that whole parts should be absorbed is new: this I was led to by observing the absorption of the sockets and fangs of the teeth. This absorption may depend upon a consciousness of unfitness in the part of remaining under such circumstances, and therefore allows its removal with ease; it may likewise depend on the state of the absorbent itself. Thus, when a part is useless in the system, the mouths of the absorbents which are applied to it are stimulated, and the work is begun. Absorption has been compared to the action of capillary tubes; but these will not take up solids. Now, my idea is, that nature leaves nothing to chance, and that absorption is performed by the particular action of the mouths of the absorbents. It is certainly reasonable to suppose they have two modes of action; the one by which solid and the other by which fluid matters may be taken up. Now, if we examine the mouths of animals we shall find a variety in them, and this variety adapted to the

variety of solid food which they are destined to take, as the fluid food can require no such variety. I can even conceive that the absorbent vessels have teeth, and that, like animals, they have mouths adapted to the different classes of matter which they are destined to absorb ; and I dare say we might class them by their mouths, if we could ever obtain a view of their different structures, and be able to point out what particular matter each mouth was adapted to absorb. Some matters are changed, and others not, by the action of absorption : thus, there is a change produced in the venereal virus by its absorption : this produces different effects, according to the surface to which it is applied, and as it is absorbed or not ; if applied to a secreting surface, it produces gonorrhœa and not chancre, as it does when applied to the surface of the glans ; and if taken into the system, it produces neither chancre nor gonorrhœa, but very different effects, and is not now the same poison ; it is become a different matter from that poison which was its remote cause ; but we know of no other poison so altered in the absorption. Essential oils, indeed, and rhubarb, do not seem to be altered by their absorption and circulation with the blood.

THE BRAIN AND NERVES.

We have hitherto traced animal matter from its change from common matter to animal matter, the particles of which have possessed such an arrangement as to produce life ; still it has other modes of arrangement, out of which arise other modes of action : from one of these modes of arrangement is produced the action of the brain and nerves, whence results the mind and sensation. The brain is passive, only receiving the impressions made on the nerves. Different states of the mind, or different actions of the brain, produce various actions of different parts of the body. Reason is a cause of will. I divide the actions of the brain into two kinds ; the first is that produced by the *impressions* made by the *qualities* of different objects ; the second is that inwhich the mind is reasoning concerning these objects and their relationship to each other. That state of the brain producing the passions of the mind is very different from that in which reasoning is concerned : this last affects the body but very little, whereas the passions of the mind produce very strong and peculiar affections of the body. They have (the brain and nerves) been thought of much more consequence than they really are, for they are not, as has been supposed, the immediate cause of the growth or of the life of a part, although they are necessary to the existence of the whole. Their employ is to convey impressions from every part of the body towards the brain, and likewise to convey impulses or notices from the brain towards the body. The former is simply sensation : of the latter, there are two kinds ; the one is the production of the passions, and the other of the will. As the power of the nerves is perfectly passive, therefore one or the other of these impressions are necessary to produce their action. Thinking is the memory of former impressions. The impressions are made on the different parts of the body, but the sensations are in the brain only. There are five different modes of construction of parts, calculated for different modes of sensation,

being adapted to receive the impressions of different kinds of matter. Sensations similar to such as follow certain impressions may be morbidly produced by other causes different from those which produce those impressions, *e. g.* a blow on the eye or ear will produce a sensation of light or sound. There seems to be a certain quantity of time and space necessary to the production of an impression, for the quantity of nerve impressed may be so exceedingly small as not to have the power of receiving or conveying an impression, and the application may be so exceedingly rapid as not to be followed by an impression. Life seems to take place in animal matter at its first change from common matter, and likewise in the rudiments of the fœtus in the womb; but sensation, in the first of these instances, requires a still different arrangement, and in the latter instance sensation takes place at the birth. Sleep has its degrees; perfect sleep is an annihilation of memory, voluntary motion, &c.; in imperfect sleep impressions are imperfectly conveyed to the brain, and form sensations as imperfect; reasoning and the memory of former impressions taking place as incompletely, those inconsistent and incoherent associations of ideas take place which constitute dreams. Nor is it difficult to suppose a waking dream; for if the animal is in such a state of mind as certainly does sometimes exist, where the mind is not at all employed, but entirely inactive, impressions lose their wonted power, memory is not at all exercised, and no voluntary motion takes place. If this state of mind can exist but a very small portion of time, it is very possible that an unnatural sensation or combination of sensations may follow from the imperfect conveying the impressions, and an irregular association of them likewise take place. That state of the brain on which sleep depends may be preternaturally increased and lengthened, as in lethargy; and the opposite state may be likewise protracted, as in the vigil of fever, &c.

SUSCEPTIBILITY.

All matter is susceptible of impressions; but inanimate matter has no action within itself. Animals possess a susceptibility of impression, and this is either internal or external. The internal is that on which depends the impressions made, and intelligence thereby conveyed to the mind of what passes within the body, such as the state of want or repletion, &c.; the external, is that on which the impressions made by external objects depend; and thus this susceptibility is connected both with the actions of the sensitive and of the living principle. From the different susceptibilities of different parts arise different impressions, and this is followed by different dispositions to action, and this, of necessity, by different actions; thus, the eye being forcibly held open and exposed to the action of a strong light, something more than ordinary pain is produced. How different the impressions, the disposition, and the action in the intercourse of the sexes from those where the susceptibility is different. To produce an action there is necessary—first, A susceptibility of impression necessary to excite the action; secondly, A disposition in the brain to will the action; thirdly, A disposition in the

part to act; fourthly, The action itself; and, fifthly, Stimuli, which are the immediate, or I should rather say remote, causes of a disposition to act; and from their impressions it is that this disposition to act arises either in the mind or body. But this disposition may arise either in the one or the other as a disease; nor must we forget, that the disposition to act is lost as soon as that action is performed.

CUSTOM AND HABIT.

A GENTLEMAN was ordered to rub in mercurial ointment for two buboes; but so far from producing good effects, the system soon shewed signs of great debility, hectic heat, colliquative sweats, &c; but these were soon removed by bark, asses' milk, &c.; and the mercury, which had been omitted a little time, was again had recourse to, and now produced only its more usual and beneficial effects; but the buboes suppurating, its use was again suspended for a short time, and again had recourse to with good effects, the buboes appearing to heal very fast. After some time the buboes appeared to be stationary, making no farther progress towards healing; when I recommended the mercury to be abstained from, and recourse had to country air and sea bathing. The mercury was now discontinued some time, and it being thought necessary again to use it, it was again administered, but now produced the same disagreeable consequence which followed its first use. This shews that custom will render the constitution capable of bearing that which at first proved highly injurious; and that the memory of the living principle or body does not hold long in remembrance what it had thus been accustomed to; but, upon its being unused to it for some time, the constitution was affected as if by an object which had never yet been applied to it. By custom and habit I mean very different things; for custom is, with me, as the negative of habit. In the first, susceptibility is lessened; in the last, it is increased. Habit is the continuance of actions which we have been accustomed to. By habit, I mean where the impression is the same though the cause is diminishing. By custom, I mean where the impression is diminishing though the cause is the same. If one take an emetic, the same quantity is not necessary a second time; a much less quantity will suffice: but this must be given before the stomach has forgot the impression of the first; the living power having memory, as it were. The same is to be observed as to custom and habit in the mind; the future effects depending upon the state of the body and mind at the first impression. Custom is prior to habit, or, in other words, forms habit. This may be reckoned one of the secondary principles in the animal machine. This in the animal is similar to the *vis inertia* of matter; for by this principle in animals a motion begun may be continued, and their remaining at rest is from a similar cause. This principle, by which we are affected by custom and habit, prevents us from even thinking different to what we have been accustomed; and hence man's little progression in improvement. It even gets the better of present sensations. Habit has no small power on the simple principle of life, as many diseased actions are continued through habit alone. In pro-

portion to the violence of the first actions will be those which are termed habitual. Habit is always gaining; therefore the full continuance of the first principle of action is not required, as little force is required to keep a body in motion.

ANIMAL HEAT.

Heat is productive of astonishing effects: it unlocks matter, as it were. It has been said by some to compel matter into action; but this seems to be only an idea annexed to the effects of violent heat; for how it is an acting principle I cannot see. The term heat originally meant only the simple sensation of heat; but, from poverty of language, philosophers have applied this term to the thing itself, meaning the matter of heat, abstracted from its sensation. It has been very much disputed whether it is matter, or only a property of matter. Heat and cold are opposite principles; they occupy different parts of the globe; they are less permanent than any other principle in the universe. Although heat is not equally distributed, it is capable of pervading all matter. Heat destroys attractions of all kinds; hence it is a cause of fluidity, and its contrary is the principle of solidity. We have no other idea of heat than that of quantity; this has always been estimated by its effects, all of which are the effects of *sensible heat;* but it has lately been discovered that many bodies retain more heat than is made sensible, and this is termed *absolute heat.* Some bodies, perhaps, may have all their heat rendered sensible; but this we do not know, as we have no means to discover the quantity of the absolute heat. The alteration of texture and position in the parts produces the sensation of heat or of cold, as the heat or the cold may be so great as to produce an evident alteration, &c. If we examine animals, we shall find they vary in their degrees of heat, different degrees being possessed by different species of animals. Friction and fermentation may be both rejected as causes of animal heat. Another theory has lately arisen: the air being found to possess more absolute heat before inspired than when expired, it was supposed that the superabundant heat might have been communicated to the animal; but this chemical mode of reasoning will not account for the varieties in the heat of animals, especially in disease.

Case 1.—A gentleman lying apoplectic, whilst in bed would become suddenly cold, and as quickly would become extremely hot; and here there was no alteration in the impulse or breathing.

Case 2.—A man lying comatose, in consequence of injury to the brain, and breathing with only half his usual frequency, was yet extremely hot.

Case 3.—A boy, who appeared to be dying, breathed so slow that 23 seconds elapsed between each act of breathing: the pulse was weak, and very slow; the body of a purple hue, the blood not passing often enough through the lungs to acquire its scarlet hue; he was very warm, though in the midst of winter, and in a room without a fire. Here the heat did not, which it ought by this theory to have done, keep pace with the frequency of breathing.

In the year 1766 I had put two carp, for a very different experiment, into a glass vessel filled with water, and this vessel was put into a freezing mixture ; the water froze, but when the congelation approached near to the animal, the freezing there stopped ; snow was added, and every means used to increase the cold, but without then freezing the fish, which were left all night in the yard, but were found frozen in the morning. Whilst the cold was thus applied to the animal, it is to be observed that it shewed signs of great inconvenience. From this experiment it appears, that whilst the animal had life it had a power of forming heat beyond that with which it was surrounded, and as life lessened, this power lessened also. (An extract from Cook's voyage, reciting the effects of excessive cold on Dr. Solander, &c., was here introduced.)

Two hedgehogs, in a torpid state, were examined, by inserting a thermometer in the pelvis, and near to the diaphragm. The atmosphere was at 44°, the pelvis in one marked 45°, and near the diaphragm 48° ; in the other the heat raised the mercury to 46° in the pelvis, and 50° at the diaphragm. A puppy, when the atmosphere was 50°, was 102°, both at the pelvis and diaphragm. In summer, the atmosphere being at 78°, a hedgehog raised the mercury to 95° in the pelvis, and 97° at the diaphragm. Every species of animal has a standard of heat peculiar to its species (a great difference even between that of the bee and of the wasp). A man is $1\frac{1}{2}$° colder whilst sleeping than waking. The torpid animals allow themselves to pass to a degree much lower than that of their standard ; and here we observe a remarkably wise provision ; for we find that the operations of the animal are suspended in the following order, the least important to the preservation of the individual being first lost, and the most important the latest. This seems to be the order: propagation the first; digestion the next; then sensation, wakefulness, and secretion ; lastly, respiration and circulation. From the experiments with the carp (p. 14), and the eggs (p. 3), we may see that matter endowed with the living principle (whether with action or not does not signify) is capable of passing some degrees below the freezing point of inanimate matter, without suffering congelation ; but when it loses the living principle it rises to 32°, and then freezes ; thus a snail in the freezing mixture sunk to 28°, died, then rose to 32°, and froze. Thermometer in the rectum of hens, $103\frac{1}{2}$°, in one 104° : the same in cocks. Is not this excess of heat for the purpose of aiding incubation ? In the more perfect animals the heat is not allowed to come so low as in the less perfect, though the bee is an exception, having it as strong as any. The parts farthest from the centre of the animal are most affected by external cold ; thermometer under the tongue 97° ; whilst chewing ice 77°, but soon rose to 97° again ; thermometer in urethra at 1·92°, at 3·93°, at 4·94°, and at the bulb 97° ; thus it was colder as it projected. From experiments on mice it appears that this power is called on to exert itself when necessary. Parts exposed to the constant action of the air lose, in some degree, this power ; as the hands in a dormouse ; the arm 64°, the abdomen 74°, towards the diaphragm 80°, towards the liver 81°. A dormouse, whose pelvis was $78\frac{1}{2}$°, and at the liver $81\frac{1}{2}$°, was put in a colder mixture at 30°, when the heat at the pelvis had risen to 92°, and at the liver to 93°. Here the heat of the animal was increased by the application of cold to the skin ; and hence it appears that animals have

a power of making up the deficiency of heat when placed in a colder medium. The cold acts at first as a sedative; but if it does not destroy the animal, it acts as a stimulus, and calls up this power of generating heat, which then goes beyond its natural action. When placed in a heat beyond their standard, animals have a power of generating cold, *i. e.* reducing their own heat. This, in part, may be done by evaporation; but besides this, the animal heat is either annihilated or else less generated. No necessity for the heat to be raised above the standard, except cold is applied. An experiment was made, by immersing a live penis and a dead one in water, heated from 100° gradually up to 118°. The heat of the dead one was raised to 114°, but the living one never rose above 102½°; the rectum of the person being 98½° at the time of the experiment. It was observed by the person who made the experiment, that after his penis had been immersed about a minute the water did not feel hot to it, but when moved there was great heat felt, so that the penis had produced cooler water all around it. General Ellis first noticed, that an animal can live in a heat greater than its own. (Dr. Cullen's opinion mentioned, Mr. Tillet's experiments slightly mentioned, Dr. Fordyce, Blagden, &c., experiments in the heated room.) In these experiments the hand seemed to burn the side when applied to it: the hand might become so hot from its habit of changing its heat so frequently, by so many applications to it of different degrees of heat, or, perhaps, rather from its being an extreme part, and more subject to the laws of inanimate matter. This power of destroying heat may be increased by the exercise of it; but in general it is limited. Evaporation is not the sole agent in keeping the body cool, but is of great effect, and a powerful assistant; but it only acts in the gross way; for there is another provision, which is connected with the powers of life, exerting its effects perhaps, in proportion as evaporation lessens, and *vice versâ*. Some animals are best when this power requires to be exerted, and perhaps its exertion is necessary.

The heat of the atmosphere should, perhaps, to be best adapted to the animal powers, be about one-third less than that of our native heat. But we have before observed by what an excellent provision man and the more perfect animals are enabled to live, both in the tropics and near the poles. The animals in the colder climates are protected against the cold by hair and feathers, substances best adapted for the retention of heat; and where the climate is coldest, we find these finest, longest, and thickest; some, indeed, have not these coverings, as snails, frogs, &c.; but the porcupine of Italy has only quills, whilst that of colder climates has hair also. But these provisions are not sufficient to protect some animals, which therefore go into a torpid state in the winter. There is a great difference in the power of conducting heat in different substances; thus, oil and fat is to water in this respect only as one to ten, water being so much better a conductor of heat than the oil. Now in whales, and in animals of that genus, we find nature has surrounded their vital parts with large quantities of fat. External heat or cold produces diseases peculiar to each; thus, heat produces diseases of some parts more than of others. Too much heat produces diseases of the liver, though, as Dr. Blane observes, this may depend on some other cause besides that of heat alone, as these complaints are not so frequent in the West Indies as in the East. Diseases of the bowels, and tetanus, are

also often produced by heat; it also tends to produce fevers. The diseases produced by cold are chiefly those of debility, as chilblains, scurvy, &c. The lungs are the internal organs which seem most affected by cold. Cold renders the venereal disease more violent; and changes from the one to the other state also produce disease, scrofula, in all its forms, being frequently called into action by such changes. Although in hot climates many impurities are by the heat volatilized and raised into the atmosphere, yet, as is the opinion of Dr. Blane, it is most probable that these bodies in their volatilization suffer a decomposition, or perhaps undergo such a mixture with the air as renders them innoxious. The plague is not known in the very warm climates, nor the jail fever; and very warm climates much less abound with diseases of a putrid nature than the more temperate climates. How does the atmosphere affect the body? is it by the lungs, or by the skin? This question it is, perhaps, impossible to solve. A noxious atmosphere is less likely to affect those who are constantly exposed to its irritation than those who are less used to it: the remarkable circumstance of the prisoners at the Old Bailey affecting the judges on the bench, the jury, evidences, &c., is an instance. Some paupers at Salt Hill infected several gentlemen by whom they were examined, whilst they themselves were not affected by it, but were in perfect health. Perhaps next to never coming within the influence of such effluvia at all, it is safest to live surrounded by them in large cities, where either from the custom of being exposed to their action, or from one effluvium destroying another, prevents these effects from taking place so much as might be expected. Venereal poison either cannot be raised in a state of vapour, or if it can, is thereby rendered incapable of producing its usual effects.

The atmosphere is a common menstruum of a variety of substances, some of which are held in it in a state of solution, and others in a state of mixture only. Water is held in the atmosphere in a state of solution, and when much of this is suspended in the air it renders it heavier, as the barometer shews; and when a decomposition of this solution takes place, which it does in rain or snow, then the air becomes lighter, as the same instrument indicates. We have of late been informed, that the variations of the magnetic needle have appeared so much to take place with change of weather, that it has been said that, by observation of the variation of the magnetic needle, as much might be learned respecting the prognostics of the weather as from the barometer itself. When the above decompositions take place in the atmosphere, the beasts and birds of the field seek their shelter; and many parts of the human body which have been affected with former ails are affected with particular sensations before this change takes place. This decomposition may take place, although neither rain nor snow is produced, and this in consequence of a fresh combination taking place before the ultimate effect is produced. Extraordinary effects are produced by the hermattan, a wind which blows off the interior part of Africa to the coast of Guinea. This wind is always accompanied by a fog; it blows sometimes a fortnight together: the fog is thickest on the beach, and gets tolerably thin about four miles inland, though the wind begins much further. It produces a pain and dryness in the mouth and nostrils; not as if from mere dryness, but as if from some acridity; if it continues three or four days the scarf-skin falls off, and the

tongue being applied to that part of the skin denuded of cuticle, is sensible of a very acrid taste. Excessive salubrity is another consequence of the hermattan, destroying any disease which might then be epidemic. It is so great an enemy to infection, that of seventy that were inoculated during this wind none were affected by the small-pox until the wind ceased, when it shewed itself in twenty of them; and the remaining fifty were again inoculated, all of which did well.

OF DISEASES.

The properties of matter may be either in a state of perfection or imperfection; the former in living bodies constitutes health, the latter disease. The state of the properties of matter in general is the inquiry of the philosopher; that of the human body is the province of the physician. In a healthy state we find operations going on by which nature is capable of restoring parts of the body, &c.

DISEASED ACTIONS

Are similar, in many respects, to healthy actions; they are, like the last, influenced by habit. Some diseased actions last only whilst their immediate cause exists, as in scrofula; some continue after the first and immediate cause is gone, as in gonorrhœa; and some are continued through habit, as in a gleet; some go on for ever until the animal dies, unless an antidote to the specific cause is applied, as in lues and cancer. Diseased actions depend on, and are produced by, laws similar to healthy actions, and these diseased actions take the same course likewise; for diseased action is the ultimate effect of an impression made on a part possessing this susceptibility. The disposition must arise from an impression, and this must be sufficient to overcome the then present natural action of that part; we can know nothing of the real action itself, but can only judge from the cause and effects. We first must observe, the mind has a susceptibility, and this differs in different men: with this susceptibility of mind a stimulus must be applied, and according to the stimulus applied so will be the disposition which arises; but this is not the ultimate effect, for the ultimate effect is the action. Every animal varies in its susceptibilities: some have them stronger than others have, and hence arises a great variety as to the susceptibility of disease; for in some, if by any means only a stop is put to the common actions, a disposition to disease may immediately arise. Some minds are more susceptible of some impressions than of others. A susceptibility may be by habit so increased, and may be so formed by art, as to appear a new creation, or it may be in the same proportion lessened; this may be instanced in fear, &c. Strictly speaking, there is no such thing as predisposition; for what is meant by this is only the particular susceptibility on which the disposition itself immediately depends. Some constitutions are more prone to some local actions, whether natural or diseased, than others are. Every constitution is composed of parts very different from each other,

the actions of which are likewise different. Hence the diseased actions may be different in different parts, though produced by the same specific stimulus ; or an action may be produced common to each part, such as inflammation. Constitutions may be universally prone to susceptibility, or the contrary ; and hence arises the irritable and the indolent constitution. Again, some constitutions are more susceptible of one specific disease than others are. Constitutions may have their susceptibility increased universally or locally. There are three kinds of susceptibility ; first, that for universal action, such as fever, &c. ; second, for original local action, as in the scrophula, which is a local action ; third, is a susceptibility, or a disposition, whose action is critical ; this is an act of the constitution ; as in the gout, a part shall take on the action of the whole body, the whole constitution acting, as it were, in that single part. Hitherto we have spoken of susceptibility ; but now we mean to speak of disposition. Dispositions are either natural, unnatural, or diseased ; they may be unnatural, and yet not diseased. Dispositions may be of three kinds, first, a disposition to restoration, such as granulation, &c. ; second, a disposition arising from necessity, as the thickening of parts, ulceration, &c. ; third, diseased disposition ; and this may arise from external applications. Every diseased disposition has, perhaps, an allotted time for its action to take place, after the application of the stimulus ; this is more particularly to be observed in specific diseases ; the same with poisons ; but this will differ with the susceptibility. The following will shew the length of time which will intervene between the disposition and the consequent action. A girl left the West Indies, to appearance in perfect health, and after she had been in England four years, a disease shewed itself, the disposition to which must have been excited four years before, whilst she was in the West Indies. A disposition simply does not sensibly affect either the whole or a part. A disposition may be destroyed or suspended.

ALTERED ACTIONS, THE CONSEQUENCE OF DISPOSITION.

These actions, or the immediate effects of them, constitute symptoms, such as arise from sympathy, as sickness, &c. These produce alterations, visible or not visible. These actions are either natural, restorative, or diseased. Those of health act according to the combined laws of the machine, and may exist either wholly or partially with respect to the whole system. Restorative actions may be the returning back to former actions. Of diseased actions there may be, improper action of whole parts, as spasm or irregularity of action of a muscle, improper action of the vessels of a part, and this may be either diminished or increased action. Perhaps the first symptom of disease is the sensation giving an idea of more than ordinary health and vigour ; at least this is certain, that it is exceedingly common for a person to say, that they never felt themselves in better health and spirits, and in a very short time after to be manifestly very much diseased. Now as many, both of the natural and diseased actions can go on without our being sensible of it, perhaps the first attack of the disease may be of this kind, and upon its

first taking place the powers of nature are called up to repel and destroy actions injurious to it; and hence may be produced the sensation above described; and this is frequently followed by that next sign of disease, which is rigor. The cessation of any action is a stimulus by which it may be made to renew its action. The suspension of natural action, by its continuance, puts a force upon the parts which are thereby stimulated to relieve themselves. The performance of any action in the same manner becomes a sedative. Irritability appears to be akin to susceptibility. By irritability the natural actions may be increased beyond their natural bounds, and new actions also, we find, are produced by irritability in a part. Irritability often produces salutary effects, such as the restoration of parts injured. Preternatural actions are sometimes so slow that we can hardly make them accord with our idea of their proceeding from irritation. Irritations are either common, specific, or poisonous: the common affects all animals; the specific affects only those of the same species, as small-pox, measles, &c. in man; the disorder of the black cattle; rot in sheep; mange in dogs. There is no action of the body but what the mind is capable of affecting; but some parts of the body are more affected by particular states of the mind than others: the mind, therefore, affects the actions of the body in diseases. The diseases in which the mind is capable of exerting the greatest influence are, perhaps, those in which action is diminished or increased, but where alteration of structure does not take place. Irregular action seems to proceed from a want of power, with a strong disposition to act. The struggles in dying are of this kind. The will seems to have some effect on the involuntary actions of the animal, so that we seem to have a power of increasing the action; but this, in reality, is only in the mixed actions, *i. e.* where both voluntary and involuntary exist, as respiration. Mr. Sterne used to say, not making this distinction, that many a man died because he would not resolve to live, for scarce any man need die without he gave himself up; for that he need but call up his powers, and determine to force his lungs to act: and he, in his last illness, actually thus exerted himself, and jumped out of bed; but his death, which soon followed, shewed his mistake.

SYMPATHY.

Susceptibility of impression, impression, disposition, and action, these are primary or immediate; but sympathy is a secondary principle of action—action from sympathy, not proceeding immediately from impression, or it is action without impression, either acting with the part on which the impression is made, or taking its action on itself. In the animal there are two principles; from the one results life, and the other the action of the nerves, sensation, and volition, &c. The existence of the principle of life is necessary to that of the rest. Out of sensation arises the feelings of the mind, and from these impulses the mind orders certain actions, the mind becoming the cause of involuntary, as reason is of voluntary actions. The most simple actions are those without the sensation of the nerves. There are two species of sympathy, a local with a

local, an universal with a local; but all sympathy must arise from a local cause, not from an universal. Sympathy not confined to the same action, or in the same person, but is transferable to another, and is not in him a secondary action, but primary, proceeding immediately from the impression made on him. We shall find that the different principles of action have connexion one with another, as that of life with that of sensation; and the most simple sympathy I can conceive is, that of any one of these principles sympathizing with its own action, then the nerves of one part with those of another; in some instances the sensation is only found in the sympathizing part; and here it seems to be almost a primary affection; thus I have known an injection into the urethra not affect that part, but the stomach: I have also known a stimulus applied to the rectum produce no sensation there, but occasion a sickness, and other affections of the stomach. But it is truly secondary when an impression made in one part, so as to produce sensation there, affects another part; as pain in the finger producing increased action of the heart, &c. Here sensation in one part is the cause of action in another part. Sympathy is a principle so connected with every possible action, that we must obtain a knowledge of this principle: it is a secondary principle. Sympathy depends on every part of the body being ready to fall into action or affection, action or affection taking place in some one part of the body. Sympathy is sometimes an imitative affection. Yawning is a species of sympathy; so are the habits acquired by living in different places. Dancing is a sympathy, being, as well as an imitative affection, the effect of an impulse made by the sensation of music on the mind, by which the mind is excited to put the limbs into action; for the mind, or the principle of sensation and the living principle, the principle of all action, sympathize with each other. The mind of one person can sympathize with that of another, and with the sensations of another; nay, we are affected for the ills of others, whilst they themselves feel them not. The actions of one may sympathize with those of another. Sympathy is often the only sensible effect of a stimulus: by this our ideas may be altered; for sympathy being the only sensible effect which, in this case, follows the application of the stimulus, and that at a distance from the point of application, it appears that a part, under a stimulus, can stimulate a distant part, and this, sometimes, without our having a sensation of the action of the stimulus on the first part.

A diseased part may sympathize with a diseased part, or a sound part may sympathize with a diseased part. Action in one part may be lessened, and action take place in another part. This is sympathetic, and is instanced in inflammation moving from one part to another. Universal action becoming local, is likewise sympathetic, as where universal action producing fever is deposited in one particular part. Natural sympathy takes place more readily where the powers of the animal are most capable of repairing injuries. The whole body is sometimes in a state which more readily falls into sympathies than another; hence the same causes will, at different times, produce different effects in the same body. Sympathetic affections are often more violent than those in the part originally affected: this is very often to be observed, and depends on the part or parts which sympathize. Sympathy is seldom

reversed, *i. e.* the shoulder will sympathize with the liver, but we shall not find that the liver will be sympathetically affected by any complaint in the shoulder, nor of the urethra from the testes, lungs nor trachea by the intercostal muscles. There are mutual sympathies, as those existing mutually between the stomach and head. A succession of sympathies may be produced; a part sympathetically affected may, in its turn, affect a part which sympathizes with it.

Sympathies may be single or double, common or uncommon; common, as that of the stomach; the uncommon I shall instance in the relation of a case. A gentleman had an issue in his thigh, which at times would itch intolerably; and whenever this itching took place, and at no other time, he was troubled with a great shortness of breathing, and pain in the side. Sympathy may be similar to its cause, or dissimilar, *i. e.* where the sympathizer takes on a mode or modes of action with the part primarily affected.

Sympathy is local, or partial and universal; partial is that arising from local disease, the cause of action in one part producing action in another part. Local sympathy may be mixed with universal, as that of the stomach and head with that of the whole system, as in fever. The same is to be observed with that of the tongue, mouth, and kidneys; these latter seem to sympathize with the want of moisture in the system, and the stomach with the system in its inability of employing more nourishment. But partial sympathy may be either natural or diseased; the latter we have just mentioned, and the natural, or salutary, are such, as the increase of the breasts of females when the alteration takes place in the uterus: the action of the abdominal muscles upon the rectum or neck of the bladder being stimulated; the action of the lachrymal gland upon a stimulus being applied to the eye, &c. Sympathy is likewise either continued, contiguous, or remote. Continued sympathy is where the primary affection spreads from its centre to every part in its neighbourhood, as ink spreads itself on blotting paper: it is by this continued sympathy that an inflammation extends itself.

Contiguous Sympathy.—In this it is not to be supposed that the sympathy is continued, as in the case just mentioned; nor is there in many of the cases continuity of parts to allow it in the manner it might be supposed to take place: the parts are to be supposed near to each other, but not continued. Of this kind of sympathy is that of the muscles of the chest with the lungs; the muscles of the abdomen with the intestines.

Remote Sympathy, i. e. when it is at a distance from the part originally affected, and the intermediate parts are not affected, as that of the head and stomach. Many of these sympathetic connexions are fixed and regular, as that of the head and stomach just mentioned, the glans penis, with the bladder, &c., but others have not originally a natural sympathizing connexion; hence it follows, that those diseased sympathies which are regular and constant, as that of head and stomach, &c., are founded on the natural sympathies; so that many diseased sympathies are natural ones preternaturally increased. Universal sympathy may be produced by a local affection, as is experienced by taking various substances into the stomach which produce a sympathy of the whole system. Universal sympathy is to be observed more in the young than in the old; for in them the sympathies are not as yet determined; the various parts seem to be more ready to sym-

pathize with each other ; and this, perhaps, because they are more susceptible of impression, for they are much more disposed to such complaints as are denominated nervous than those which are attended with fever ; thus teething in children, which produces a local disease, seems to be capable of giving a susceptibility of universal sympathy ; but as the child gets older, and the natural actions take place, so the sympathies take their natural course ; and in those which are older, the cutting of a tooth is found to give but little pain or trouble. In consequence of a great local injury universal sympathy may take place, producing symptomatic inflammatory fever, then sympathetic hectic fever, and, lastly, dissolution. In consequence of such an injury, besides the consequences just mentioned, inflammation, suppuration, convulsions, fits of various kinds, permanent convulsions, or tetanus, are produced ; but the most common effect of universal sympathy is the universal symptomatic inflammatory fever just mentioned ; and as a cure takes place this symptomatic fever goes off. If the part cannot effect its cure, the sympathetic hectic fever takes place ; and this is a consequence of the system being teased upon its efforts to relieve the part proving vain, and the part remaining incurably diseased in the system ; for if this incurable part is removed, this fever will also be taken away. Thus, a man who had had a diseased knee for a considerable time, which had produced a hectic, with a train of very ill symptoms, and had not had a wink of sleep for a considerable time, though the pain was not excessive, yet upon the knee being amputated, he had an exceeding good night, and soon lost those evil symptoms : the same took place in a case of diseased elbow-joint. Universal sympathy is greater when some parts are injured than others ; thus, greater from parts concerned in involuntary actions than voluntary ; in the stomach than the arm ; and also more considerable when a vital part is injured. Universal sympathy is greater if remote from the seat of life than if near to it, the system feeling a consciousness of greater inability to repair the injury, the powers moving the blood, &c. not acting so strongly ; for instance, in the leg as in the trunk. Universal sympathy sometimes stops instantaneously. The stomach is oftener the cause of universal sympathy than any other part : it would appear as if it were the seat of universal sympathy. Many parts sympathize with the stomach, as it does also with many, but with some more than with others, as the head or testes ; and some likewise sympathize more readily with it than with the other parts, as the head and skin. This last sympathy is very plain in the effects produced on the skin by different substances taken into the stomach. A child was affected with an eruption on the skin, which no medicine could alter, and by some it was supposed to be venereal ; the nurse was changed, and as soon as milk, different from that which had produced this sympathetic affection was applied to the child's stomach, this eruption went off. A glass of cyder, and of many liquors, will in this manner produce a flushed face. Cold water applied to the stomach will sometimes produce very troublesome eruptions on the skin, called surfeits. Quere. Whether the stomach does not lose some of these sympathies ? A lady, who had been burned very much in her neck and breast always felt a scalding pain in the cicatrix whenever she drank any warm liquor. Did there not here exist a sympathy between

the mouth and gullet and this part? A mutual sympathy exists also between the intestines and the skin.

Continued sympathy is more commonly similar than the remote is, as it is a continuance of the same action, and generally in a similar part, which therefore must be capable of similar action; and this may be, and yet the parts may not be exactly similar in their structure: thus a chancre may extend from the penis to the scrotum, yet it is a chancre equally with the original, although it may acquire some peculiarities in its appearance, &c. Its similarity or dissimilarity may arise from the different sympathy produced; thus, a stimulus in one part may produce different properties of the principle, productive of different sympathies; and, first, even where the action or affection and the sympathy depends upon one and the same principle: thus, let us see how this may happen in the principle of sensation. Now we know that sensations in the brain are not similar to those in any other part of the body, and that those in the stomach are different to those of many other parts, and, may be, are like to none of those of the brain; nor, indeed, are all the sensations of the stomach itself alike: hence may arise a dissimilar sympathy from the difference of properties in the same principle, the part affected giving sensations different to the sympathizer. Secondly, difference of properties producing dissimilar sympathies between two different principles, as the principle of life and that of action. For as sensation in one part may produce a sympathy in a part whose actions are dissimilar to those of the other part, the sympathy produced will be dissimilar, and this resulting from the difference in the properties of the principle of action; again, the actions of life not being always the same, as in the stomach, any of its peculiar actions may produce one sympathy in a part, and another mode of action may produce a difference of sympathy in the same part. The mind may sympathize with the principle of life; of this we see instances every day in the effects of the passions on the body: this sympathy may be one of the actions of life, with a peculiar state of mind, and *vice versâ*: the more we consider these the more inexplicable they appear. What a variety of sympathies may be produced by one irritation, as in teething, or worms in the intestines; from these amazing connexions of sympathy it becomes one of the most extensive principles in the body. Sympathy must be always similar where the actions of each part are always similar; and it may be similar although the part has a variety of actions or affections, but then it must be capable of taking on that one particular action or affection. Continued sympathy will, I believe, if it even extends to a dissimilar part, still be a similar sympathy; thus, an inflammation continued from the diaphragm to the liver is, I believe, a similar sympathy. The sympathy must be dissimilar where the sympathizer cannot put on actions similar to the part first affected; thus, any part sympathizing with the stomach cannot put on sickness. A substance taken into the stomach may produce heat in the face, and nothing of the kind be produced in the stomach; the one part not being capable of admitting the particular affections of the other. A simple stimulus may not only be capable of producing a similar or a dissimilar sympathy, but may produce both; this

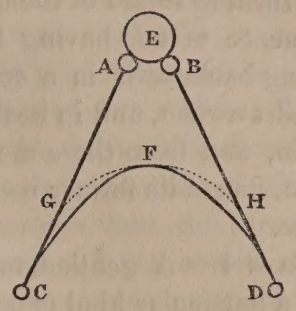
depending on the actions or affections of the different parts. The most simple sympathy is, perhaps, to be found in vegetables, these being much more simple than the most simple animal. Vegetables have, indeed, actions and affections, and of these a great many; but all proceed directly from the principle of life; so that, though sympathies of its different parts may be compounded, yet still they must be more simple than those of the most simple animal. The motion of the sensitive plant is only produced by a succession of simple sympathies; something like this may be found in the sympathies of the more imperfect animals; but no animal can be so simple in all its sympathies, although it may be in some. I shall at present suppose, that every part of an animal is liable to be affected by the stimulus of agreeable or disagreeable sensations, and the more simple the animal is, the more likely it is for every part of the animal to be under the same simple sympathy. A polypus is a very simple animal, but a child in the womb is still more simple, as I believe it can only have sympathy with a state of want in the system; but even this, perhaps, it has not, as it has no demand on any part of its own body for this supply; therefore there can be no part to sympathize with this want in the system. Similar sympathies, on the same principle, may be compared to unison in sound. A polypus, though so very simple an animal, we may yet suppose is likely to be affected by agreeable or disagreeable sensations, hunger and desire of propagation. Now, we will see what takes place with hunger, in which state the stomach is excited; but, although it is affected by the want of the rest of the body, it has no affection or action similar to those of the rest of the body, and therefore it is affected by a dissimilar sympathy, and calls different parts of the body into action, as exciting the polypus to erect its little arms to catch food, and this is, therefore, a reflex sympathy, as it were, even in this most simple animal. A difference of action, affection, &c. in the sympathizer from that of the part first affected does not always follow from a difference in the two parts, but often from a difference in the mode of impression; one mode producing a peculiar sympathy, whilst another mode of impression would produce a different affection, which would be followed by a different sympathy; thus, the application of one stimulus to the stomach may produce headach, whilst this again may be removed by the application of a stimulus of a different kind; and by this difference in the mode of impression a similar may arise, perhaps, in parts not entirely similar. How far sympathy is similar to its cause, when that is of a specific nature, is not always easy to be known; in some it may, and in others not. This may be from sympathy being a general affection, and not capable of being altered by a particular affection; thus, by sympathy the glands in the groin or the testicle may be swelled by venereal irritation in the urethra, but this is not venereal, but simple inflammation; and in the same manner may the glands in the axilla be affected by a cancerous breast, and this only inflammatory from sympathy. I should suppose that specific stimuli cannot produce specific sympathetic actions or affections. Actions or affections may produce similar sympathies, although there may be a difference between the effects in some parts and in others; thus, inflammation in the testicle is the same as in other parts, but will differ in the effects produced, such as difference in kind of sensation, &c. The living principle in the body sympathizes with the mind;

thus, affections of the mind will affect with involuntary motions even those parts which are under the influence of the will: this may be instanced in the effects of fear, grief, and joy on the sphincters of the anus and bladder, the lachrymal gland, &c.; and either of these three affections of the mind will alter the secretion of the mouth and tongue. Some are so delicate as not to be able to void urine if they suppose any one looks at them. A lady who saw the oar fall from Mr. Lunardi's balloon, and thought it was Mr. Lunardi himself, was so affected with the idea, that she expired before Drs. Osborne and ——— could arrive to her assistance. Particular parts may sympathize with the mind more readily than others; but I believe this sympathy is, in most cases, universal. By the mind sympathizing with the living principle, I suppose a peculiar state of mind may be produced; thus, a man in pain has not only the sensation of pain, but is also depressed in his spirits. Depletion may also, in the same manner, produce a peculiar state of mind, by the mind's sympathy; but these are not instances of the mind's sympathizing directly with the principle, because sensation is also concerned, and forms a connexion between the other two; and by the medium of our sensitive power it is that our mind sympathizes with our wants. But there are many instances of the mind's being affected without any sensible cause, as in hypochondriacal cases on the one hand, and, on the other, when the mind feels itself particularly at ease: in the former case the mind may sympathize with some morbid, though not sensible, alteration in the living principle; in the latter case, we may suppose the mind does sympathize with the principle of life in its vigour, &c. The sympathy of the mind with the body is particularly observable in the injuries of parts belonging to voluntary motion; for in proportion as the part loses its power, so does the mind lose its confidence in the part, which is regained as the part acquires its power. Sympathies have some uses, and answer some very important purposes; they form connexions between different parts, and between thedifferent principles of life, sensation, and motion: they produce salutary actions, as when the lungs or trachea are irritated the muscles of the chest are put into action to expel the irritating cause; and by this it is that the muscles of the abdomen are called into action for the expulsion of the child from the womb. Sympathies likewise assist us in discovering some diseases which lie hidden: thus, pain in the shoulder, from a disease of the liver; a pain in the knee, from a lumbar abscess or disease of the hip; itching of the nose, from irritation of the stomach and upper part of the alimentary canal. But, although they may, in some cases, do us this service, yet it is as true that in many cases these sympathetic affections serve to mislead us: it may then be said that the sympathizer relieves the part first affected; but there is nothing gained by this, for the last affection is sometimes worse than the first; as when the irritation of the urethra affects the testicles. It may be said, perhaps, that the one affection differs from the other, and to lessen each other's effects; thus, that of the liver is depressing, that of the shoulder rousing. Again, it may be for our good, by diffusing the pain; as a quantity of absolute pain may be so diffused as to become insensible; but are we sure that this sympathetic pain is not an addition to the former pain?

The impression on the mind, which does not accord with the sensation, as the liver

and shoulder, has been always referred to sympathy ; but, I believe, it is not properly sympathy, but a delusion in the mind, and perhaps may be produced in some such manner as this :

In the subjoined, C is supposed to be a diseased part, from which the nerve A G C passes to the brain E, of which A is a part. D is supposed to be the sympathizing part, communicating by the nerve B H D with the brain E, of which B is a part. F is supposed to be a nerve running between the nerves G and H, and forming a communication between them. Now if there should be an inaptitude for conveying the impression in any part of the nerve between its point of uniting with the connecting nerve and the brain, then, in proportion as this exists, will the impression be prevented from passing through the nerve A G C ; and will pass by the connecting nerve F to the nerve of the sympathizing part B H D, and by that conveyed to the brain, giving to the mind the idea of impression arising from D, when it in reality arose at C.



DELIRIUM.

It will be very difficult to prove whether delirium is a disease of the brain or nerves. From the connexion between dreams and delirium, it will be necessary to consider sleep and dreams. Perfect sleep is a cessation of the susceptibility of sensation, a cessation of the consciousness of existence, and a cessation of the relationship which our bodies bear with other bodies ; but whether this cessation of susceptibility arises from the brain not having the power of receiving, or the nerves not having the power of conveying, is yet to be determined. Dreams proceed from an action of the mind in sleep, and therefore may be independent of impression, and are without a consciousness of the relationship between the mind and body, and the body and other bodies ; therefore, in dreams, we lose that power of distinguishing between real sensation and thought, which constitutes wakefulness. In a delirium, as in sleep, we find the susceptibility of external impression is lessened. Whilst sensation is continued, sleep is kept off: delirium likewise may be lessened, by arousing the mind from that particular state by external impressions ; so far delirium appears similar to dreams, but it widely differs in other respects. In natural sleep, the more the brain puts on that peculiar state, the *less* we have of dreaming ; but the more the other state is put on, the *greater* the delirium. Dreams often do arise from sensations of the body being conveyed to the brain, it being in an imperfect sleep ; but the consciousness of the connexion between our own body and our own mind being cut off by the state of sleep, the sensation may, or may not, be referred to our own body ; it may be referred to some other body. In some cases it is not referred to the part of the body whence the impression is received : the same thing happens

in delirium, when the connexion is cut off; then, not distinguishing between real sensation and thought, what the mind thinks about appears to be real.

But even where the mind is in full possession of the consciousness of its connexion and relationship with the body, we have, in some cases, this delusion, as the appearance of the turning round of the objects around us, whilst they are really fixed, and that in consequence of our having turned round quickly; giddiness from going to a height; from riding backwards in a coach: delusion is also an effect of intoxication and disease. Whilst awake, and in health, impressions produce sensations which are conveyed to the brain, and from these the mind reasons; but, suppose the mind to have lost, or, as it were, forgot its former connexion with our body, then the above false reference takes place.

Case 1.—A gentleman came into this country in 17—; his memory was imperfect, and a particular kind of delirium began whenever he was going to sleep, but afterwards continued whilst wide awake, and for a week before his death he was not quiet from this delirium a moment, but whilst impressions were forced on him by external objects. His delirium was of this kind: he was continually talking of former circumstances of his life, but referring them to the present moment, and to some other person. There was a revival of past ideas in his mind; but from want of connexion between his mind and body, he was not enabled, by his present impressions, to infer how little relationship they bore to the present time, or to those persons to whom he referred them; at the same time it really appeared more a want of connexion between the mind and body than the mind itself being hurt, for he determined rightly what should be done in those circumstances which he supposed present, and would express his sentiments in really elegant language. That it depended more on want of connexion than on disease of the body, appeared from his being sensible of impressions, and referring them to the part where they took place, but supposing that to be in any other body but his own: thus he would tell his nurse and the bystanders that they were hungry, or thirsty; but upon offering food or drink it appeared plainly, by his eagerness, that the idea had arisen from a sensation of hunger in his own stomach. He would shew great signs of distress and anxiety, which, he would say, was because his nurse wanted to go to the close-stool, but was restrained by his presence, and this from his own sensations also: he had a violent cough, which he would sympathize with some bystander in, proceeding in his story after the cough, no otherwise disturbed than by sympathizing with the person whom he thought so unfortunate in having it. The objects about him were more to him than his own sensations.

Case 2.—A gentleman who was fond of his bottle, as he became intoxicated, referred all his own weaknesses and feelings to those around him, supposing that every one but himself was drunk; and upon his going home would insist upon undressing all his family, and putting them to bed, declaring that they were too drunk to do it themselves; and this happened not once only, but whenever he was intoxicated. I myself once experienced what I have since thought must have proceeded from this want of connexion between the mind and body. I was reading a remarkable case, and reasoning with

myself upon it, when I found the letters and words made an impression on the retina, but that I was incapable of affixing a meaning to them ; this, I thought, might proceed from want of sleep, but that was not the case. I tried repeatedly, but without effect ; and at last went to bed, from which I did not move for three weeks, a violent complaint in the head succeeding this extraordinary circumstance. It may not be amiss to say, that the case I was reading was that of the late Mr. Foote, who was not able to command his attention to more than one circumstance or action at a time : thus, if he took his snuff-box out of his pocket, and held it in his hand, it was very well, until he attempted another action, such as taking a pinch of snuff out of it, and then the box immediately fell out of his hand : in fact, he was going back into a state of childhood ; for a child is not capable of commanding his attention to more than one circumstance or action at a time : give him first a stick to hold, and call his attention to another object, the stick will be dropped ; for it is by habit we become capable of attending to several actions at a time. Turning round, or passing quickly by different objects, it appears as if they were in rapid motion ; and if the motion of the body is stopped, the delusion will still continue for some time. If a person is blindfolded, and put into a coach, he will think he is moving forwards, though he is really riding backwards. An impression from any part, either healthy or diseased, may be conveyed, yet there be no consciousness of the mind from which part of the body it was conveyed, the mind having full possession of the impression, and a perfect idea of it, but having nothing to direct it right in its reference of it. It must refer it somewhere, and is more likely to refer to another than to itself : thus (vide p. 27), A does not refer the sensation to C as a cause, nor will B sympathize with A, so as to refer it to D.

Case 3.—A gentleman (a medical man) dreamed he had given to a patient too strong an injection for a gonorrhœa, and that it had produced a total stoppage of urine : he awoke, and found an erection of the corpus cavernosum of his own penis, and that he could not void a drop of urine. Here was impression without the consciousness, and hence he referred his own feelings to another person.

Case 4.—A gentleman, upwards of ninety years of age, suddenly lost his senses, and, in consequence of this, was a reference of all the ails which he might be supposed to feel to his wife, who had been dead some time, but whom he now thought alive, and ordering the utmost silence to be observed, lest by noise her illness should be increased. The new-born child has probably sensation without this consciousness. The contrary takes place where a person refers the sensation of others to themselves, or where the idea of sensation is supposed to be sensation itself, as happens in those who are affected by animal magnetism. I was asked to go to be magnetized, but at first refused, because the spasm on my vital parts was very likely to be brought on by a state of mind anxious about any event. Thus, at my country box, I have bees, which I am very fond of, and I once was anxious about their swarming, lest it should not happen before I set off for town ; this brought it on. The cats tease me very much, by destroying my tame pheasants, partridges, &c., and rooting up my plants. I saw a large cat sitting at the root of a tree, and was going into the house for a gun, when I became anxious lest she should

get away before my return ; this likewise brought on the spasm : other states, where my mind is much more affected, will not bring it on. Now I feared lest my anxiety for the event should bring on my spasm, and that should be imputed to animal magnetism ; but considering that if any person was affected by it, it must be by the imagination being worked up by attention to the part expected to be affected, and thinking I could counteract this, I went : and, accordingly, when I arrived at the place, I was convinced, by the apparatus, that every thing was calculated to affect the imagination. When the magnetizer began his operations, and informed me that I should feel it first at the roots of the nails of that hand nearest the apparatus, I fixed my attention on my great toe, where I was wishing to have a fit of the gout ; and I am confident that I can fix my attention to any part, until I feel a sensation in that part. Whenever I found myself attending to his tricks, I fell to work with my great toe, working it about, &c., by which means I prevented its having any effect on me.

DISEASES, CONSTITUTIONAL AND LOCAL.

It is difficult to know a truly local disease from one which is constitutional. Many diseases are entirely local : some are local, though produced by a constitutional disposition, or the cause being general in the constitution, but producing its effects strictly local. Diseases then are : first, constitutional ; second, local ; third, mixed. They may be originally constitutional, or originally local ; they may take place independent of each other ; or they may affect one another. Constitutional may be : first, universally constitutional ; or, secondly, constitutionally local. The first of these is where there is an universal action, and which is according to the constitution, and the influence exciting it ; as in fevers, varying with their exciting cause and the constitution. The effects of external causes will be as the constitutional action is at the time, except that is a specific action : thus, a cut will partake of a fever, if that fever is a common one ; but it will not take on the specific difference in the constitution, as of the small-pox. In fever every part of the body takes up that particular mode of action : ague is the same whilst it lasts. These, I think, have no disposition to local action, although a local action may form at the same time.

Constitutionally Local, is when there is an universal susceptibility to produce local affection, but this does not take place until brought into action by disturbance. Thus it is that scrofula is produced by fever, not as the termination of the fever, the part having been disturbed by the general action which had taken place : the same thing would have ensued if the disturbance had been in that part only. This seems evident in those indolent inflammations following fever, which are too often supposed to be a deposit, whereas they only depend on a disposition to diseased action when disturbed.

The scrofula goes no farther than a susceptibility of diseased action, and is only local, because in a part well disposed to continue the action. Perhaps there is no term so vague as *constitutional :* a true constitutional disease is one arising, as it were, sponta-

neously in the constitution, partaking of the nature of the constitution itself. Influenzas, perhaps, act on the constitution as a poison, altering the nature of the constitution.

Originally Local.—First, where there is entirely local action, and which takes on no specific action of the constitution, but which might take place in any constitution.

Of the Mixed.—These may be said to partake both of the original and of the local, and may originate from either of them : they may be secondary, e. g., original local, producing another local disease in another part, by something like but not similar to common sympathy ; a local may be affected by a constitutional. The first is where a local may follow a constitutional, but it is difficult to say when a constitutional produces a local, as its time of occurrence is not an infallible direction. It is an act of the constitution following small-pox, fever, gout, erysipelatous fever, &c. ; and on this depends the doctrine of revulsion. The gout is most prone to this property of producing a local affection. These acts of the constitution, as I call them, appear in forms varied by various circumstances, particularly of the constitution itself. I will endeavour to illustrate these acts of the constitution by what takes place in a tree, whose endeavour is to throw out top shoots ; but cut these, and put a stop to the action, and it will immediately commence that action in some other part, and, if stopped there, will commence in another, and so on : thus it is with the gout ; and particularly may be exemplified in St. Vitus' dance, for stop the shaking in one limb, and it will commence in another ; this action so belonging to the constitution, that it will be carried on somewhere. The second is where the constitutional affects the local, the local becoming of the nature of the constitutional, and is to be cured or altered with the constitutional.

Diseases, truly local, are little affected by changes in the constitution ; though there was a kind of exception to this in a lady who had a ganglion on her wrist, which was always painful when she was out of order. A local disease may be followed by a constitutional one, which is the third class, and these differ as to time ; those which are immediate, following the local injury directly, are, the delirium, and the symptomatic, or, as I call it, the sympathetic inflammatory fever. That which comes next, as to time, is the hectic fever, generally followed by dissolution ; and the most remote, as to time, are those symptoms termed nervous, such as the locked jaw, &c. ; but these last are of the third class, being local affections in consequence of local injury. Here it is to be observed, that hectic fever owes its origin to local action of the solids ; or it is a consequence of a sympathy with a local disease, the constitution being teased and worn out by the consciousness of having a part of the system incurable by any act of the system. The sympathetic inflammatory fever is immediate, rousing up the vital powers, and giving the alarm of the injury which the system has received. The delirium appears to be the consequence of an action of the brain sympathizing with the part injured. Undoubtedly during the existence of this inflammatory fever it may lead the local disease into the same nature with the state of the constitution. Dissolution is the last stage, whether of local or constitutional. A man may lose his leg, and in consequence he may have sympathetic inflammatory fever, which may run so high as to bring danger with it ;

but if this subsides, a hot fit of fever (hectic) may come on, until dissolution is produced by it; or this may go off, and the nervous symptoms, such as locked jaw, come on, which may also end in death.

All diseases are either common or specific; but it is probable that most diseases have something specific in their nature. The common appears to be those in which the natural action is so altered as not to require any thing specific in their cure. Many diseases are specific in their nature, though their causes are not so, as in gout, ague, cancer: this last will, indeed, produce a specific cause. Specific diseases all differ from one another, and, if truly specific, can only arise from one cause: gout, ague, and even cancer, may be produced by many causes. In these there appears a specific susceptibility of this or that particular disease; but in those diseases which are truly specific there must be a specific susceptibility, and a specific first cause. We have it not in our power to increase a specific disease, as they (specific causes) always act with their full force, unless it is by rendering the constitution more susceptible of it, which effect will be had from cold in increasing the susceptibility of scrofula. Every specific diseased action depends upon two circumstances, the common and the specific; thus specific inflammation and suppuration are but inflammation and suppuration, to which is joined a specific property, but still it is but a simple action, possessing a specific property. Specific diseases are as much known from their cure as from their particular mode of action, for they are cured by a specific medicine. Specific disease is either universal, as fever, or local, as scrofula; others are mixed, as agues, rheumatism, &c., and these admit of cure from a variety of medicines. A circumstance worthy of notice takes place with respect to local specific diseases: parts appear susceptible of them as to take on their action so readily, that, were it not for another very curious circumstance, we might soon expect them to spread over the whole body; but the favourable circumstance I refer to, is where the disease is spreading very fast, affecting parts which the disease has not yet touched, whilst in the centre this diseased action does no longer take place. Those parts which have already suffered this action appearing to have lost their susceptibility of it, whilst the surrounding parts are contaminated by sympathy with those parts already affected: this property belongs to many, as erysipelas, herpes, &c. I have seen the same thing take place in ulcerated bubo spreading over the whole belly and thigh, but healing in the centre. Another circumstance is to be added to what I have mentioned, as hindering the disease from extending over the whole body, which is, that the constitution itself alters or loses that particular susceptibility, before such an event takes place.

Different parts differ very much in their particular power of resisting disease, as well as in the power of curing themselves, or getting rid of the diseased action, and putting on a curative one: this seems to be as the strength of circulation is in the part, where there is less; so is the other also, and hence this is greater in a muscle than in a bone or a tendon. But in specific diseases I should suppose there is little difference, in this respect, in consequence of a difference of structure, although we know that specific diseases affect some parts more than others, as the small-pox affects the skin, the

measles, the skin and surface of the lungs; hooping cough and canine madness, the throat, &c.

The diseases peculiar to different ages are perhaps more of the specific kind than of the common. The age of man may be divided into three parts: growing, stationary, and declining; but it is difficult to say where the middle begins, and where it ends. The young and the old are more susceptible of diseases than the middle class; the young are more susceptible of sympathetic affections than either of the other two; they are also more subject to scrofula, which may produce consumption; to complaints in their bowels, to worms, to water in the head, &c. The middle age has few diseases peculiar to it, except those termed nervous and hypochondriacal: they may have accidentally the diseases of either of the other class; and often, by intemperance, &c., lay foundation for the diseases peculiar to age. In the old there is as great a variety as in the young: in the former we have often a degree of irritability, with weakness, producing inflammation and mortification, cancer, stones in the gall-bladder, ossification of the arteries, increased irritability in the urinary bladder, and diseases of the prostate gland.

Difference in diseases from difference in climate is considerable; the differences chiefly depending on the degree of temperature, and those of dryness and moisture, though other circumstances may contribute. The climates are hot, cold, or temperate. In the hot climates the actions, both of vegetables and of animals, are carried on much more rapidly than in the other climates; diseased action is likewise carried on equally fast, as well as absolute death and putrescency; it being no unusual circumstance in such climates for a disease to run through all its stages in a few hours, death taking place very soon, and putrescence succeeding directly. Fevers, violent vomitings, affections of the intestines, &c. are frequent in hot climates: the voluntary actions are by hot climates lessened, and the involuntary are increased. Mr. Jones, the inventor of the machine for correcting distorted spines, informed me, that his machine would produce much greater effects in summer than in winter; and that, if the disease is let alone, it will make more rapid progress in summer than in winter, shewing that parts are more ready to yield to any particular action in summer than in winter. Some diseases are increased by cold, though their sensations are increased by heat.

Cold climates retard many of the actions, both of vegetables and animals. Cold in a certain degree becomes a stimulus, and produces action; but this is not an action of ease or luxury, but of defence, being produced in consequence of the system being alarmed: these do not produce so many diseases, nor such a variety, as do the warm climates; nor are the diseases of cold climates so rapid in their progress, the powers of action being less in the colder climates. They lead to an increase of the voluntary actions, which produces a more salutary warmth than that which is acquired by external heat. In cold climates, seeming death is not so soon produced as in hot, and it is a long time before absolute life is gone after visible death has taken place, animals retaining the power of contracting their muscles upon the application of stimuli for twenty-four hours after visible death.

TEMPERATE CLIMATES.

From there being in these a more irregular medium as to heat and cold, so they pro duce more diseases than either of the other climates: in the temperate are to be found, scrofula, colds, and their various ill consequences, agues, &c., increased by the changes of the season and the mutability of the weather.

SEASONS

Call up various diseased actions, by arousing the powers to get rid of diseased dispositions, incompatible with the change in the body effected by the change of season; thus the season becomes the immediate cause of the disposition taking on action, and this produces various diseases, and has given rise to the term of 'setting the humours afloat' with those who were favourers of the humoral pathology. Neither spring nor autumn is so healthy as has been supposed, the body being more easily affected then, than at any other time: the same thing also takes place in vegetables, they being more subject to blights when the winter is becoming summer, and *vice versâ*.

Such diseases as have acquired the term constitutional, or where there is a particular susceptibility for any action, it is in the spring, or autumn, that these will appear, as scrofula, rheumatism, scurvy, &c.; and many of these diseases suffer a cure by the succeeding summer or winter. I should doubt very much whether the diurnal revolution of our globe can have any other effects on us than that which is the effect of our regular and habitual modes of acting: light or darkness, with their effects, can have no immediate effect on the system.

EFFECTS OF THE MOON.

Besides the effects of climates and seasons, the moon has certainly considerable effect on the human body, particularly where the mind is affected, as is very evident in mad people. The full of the moon seems to produce the greatest effects. Particular constitutions seem to be more affected than others; also those who have received any injury on the head.

Case 1.—A lamplighter by a fall injured his head. Upon examination I found a fracture running through the foramen magnum of the occiput: he recovered, but was troubled with pain in his head, which always very much increased at the full of the moon, and was always worse also in the spring.

Case 2.—A boy had a scrofulous sore in his knee; he was also constantly deaf, except in the autumn, when his hearing would return, and the sore in his knee would discharge considerably.—Agues also seem affected by the moon as well as by the seasons.

RECENT AND HABITUAL DISEASES.

Disease is generally accompanied with much more action when recent than when become habitual, owing to the parts, or the constitution in general, taking alarm on the first discovery of disease, and putting on a violent action to rid the system of of it ; and we accordingly observe that most diseases are at first most violent, and lessen in their force afterwards, the constitution becoming habituated to the diseased action, and is therefore less disturbed by it : this seems to be the case in diseases which are called chronic. There is a power in the constitution, by which a repetition of the natural actions is produced by habit ; somewhat similar takes place in diseased actions. It sometimes happens that a stimulus, for the above-mentioned reasons, loses its wonted effects on the system ; but then it often happens, likewise, that the patient experiences a very bad state of health, owing to the constant action of this cause, though it may not arrive to such a height as to produce its usual effects ; besides, the constitution may become wearied with its constant endeavours to get rid of this cause. Thus, the venereal poison may not possess its stimulating power to the degree of producing its usual effects on the system, and then we shall find that a state very different from a healthy one takes place : thus it is that climate will also act, and also places impregnated with contagious particles. In the same manner is also produced those violent irritations by the bites of bugs, muscatoes, &c., when a person is at the first exposed to them, but which effects cease when the constitution has become accustomed to this particular irritation : the same effects, I am sure, take place with respect to the venereal poison. A tight gartering of the leg will cure the cramp, but as soon as the habit is accustomed to this irritation the cramp again returns : upon a new alteration taking place, by omitting the garter, the cramp is also cured ; it may therefore be kept off by this alternate wear ing and leaving off the garter.

The body, once affected by some stimuli, never forgets, as it were, their action, and thereby is never again affected by that poison, as in the small-pox, measles, &c. The constitution may, with respect to the natural actions, be in two opposite states : the first, that of a habit of rest or indolence ; or, secondly, that of a habit of violence as to action : the same states take place with respect to preternatural or diseased actions ; the first being found in such as are very slow in their advances, or where the first action excited by the disease is gone by without curing the disease. An original disease may be cured, and its consequences remain : the second is to be found in inflammation.

ALL DISEASED ACTIONS ARE SIMPLE.

Thus we find that inflammation, which is a simple action, may have a specific action joined with it, which shall render its ultimate effects different from those which in common are produced by it ; but these two actions do not in this case act separately, but

an alteration in the mode of action is produced by the joining the two actions ; yet an alteration in the mode of action does not imply two modes of action. Every disposition and its action is simple ; something may happen which may alter it, and then another action takes place ; but it may be supposed they join, and make two. My opinion is, that, in consequence of their being joined, they make a third ; thus, from the action of the venereal, and that of its means of cure, a third action arises ; in the same manner as from the emetic and opiate in Dover's powder, neither sleep nor sickness is produced, but a third action of sweating. Some will take on their specific action from almost any cause, as scrofula from fever, cold, &c. ; others require their own specific first cause. No two actions can take place in the same part at one and the same time. A patient may have two diseases, but no two of them can exist in the same part of the body at the same time. In two eruptive diseases, the consequence of fever, the respective eruptions cannot take place together, since the preceding fevers cannot be coexistent. Suspension of small-pox fever, by measles, may be brought forward as an example. To illustrate the opinion that but one diseased action can exist in the constitution at a time, the following cases may be adduced :—

The first, where a patient was inoculated, the arms began to inflame, when, on the fourth day, the measles fever came on : the measles came out, and went their course ; after which the variolous fever and eruption came on.

The second case was similar to the first, except that the morbillous fever came on before the arms began to inflame, nor did they inflame until the measles was over.

The third case was that of a lady, inoculated by Mr. Sutton, who had the measles come out whilst the small-pox was maturating, which was thereby put a stop to until the measles were gone, when the maturation again took place, and the pustules spread more than is commonly the case.

The fourth case was that of a lady, also inoculated by Mr. Sutton, who had, two or three days afterwards, a putrid fever, with petechiæ, come on : this was cured, and at the end of thirty days the variolous fever came on, and eruption followed.

TOO GREAT ACTION.

This will often be followed by too little, as mortification following inflammation. Too great action of the whole may be followed by that of a part, and that of parts, by that of the whole.

TOO LITTLE ACTION

Is when it is within the bounds of health : this produces indolent diseases, or it may produce weakness ; it may be a cause of irritability. Weakness may be universal or local, for some parts may be weak, and others strong.

THE WRONG ACTIONS OF VESSELS.

These produce a great variety of diseases, for the vessels are employed naturally in erecting and pulling down ; nor are they less active in disease : the arteries giving us cohesion of parts, form new parts, and increase the size of others, and the absorbents are busied in taking down parts ; but these different actions of the vessels may take place differently from the original intentions of nature, and may, by their wrong actions, produce such alterations in the system as may be the cause of painful or disagreeable sensations in the body, and corresponding sympathy in the mind. These powers being carried on in a diseased way, may remove parts, and form tumours, deposits of osseous matter, &c., occasioning loss of general health, &c.

GENERAL OBSERVATIONS ON WRONG ACTIONS OF PARTS.

Those actions of the machine which are of whole parts, as of the muscles, of the brain, of the organs of secretion, &c., may also act wrong, producing spasm, locked jaw, St. Vitus's dance, over-acute sensations, too great irritability, and diminished, increased, or vitiated secretions. These alterations may take place either with the parts concerned in voluntary motion, or in those concerned in involuntary motions. Of the voluntary there are three kinds : first, the vibratory motions of the muscles, as in paralytic cases, and St. Vitus's dance ; these only continue whilst the mind is awake, and has its communication or consciousness with the body, and are increased by the mind being directed to them, as in the endeavour to prevent them : secondly, when a muscle has been put voluntarily into action, and has that action forcibly continued ; thirdly, where neither the mind nor will has any influence, as in tetanus. The cramp may perhaps depend on something constitutional. St. Vitus's dance may be the consequence of other diseases, as of worms. Locked jaw may follow injuries ; but in these there must have been susceptibility for that action. Of the two first classes it may be remarked, that some alteration takes place, in consequence of particular states of mind, and that they are opposed to the will, as any anxious endeavour to prevent these actions always increases them.

Case.—A lady, at the age of seventy-one, had universal palsy : every part of the body shook which was not fully supported. The muscles of respiration were so affected, that respiration was with difficulty effected ; but in sleep the vibratory motions of the muscles ceased, and the respiration was performed more equably : any endeavour of the will to alter these morbid actions increased them. I never saw the wry-neck in men.

THE UNNATURAL ACTIONS OF INVOLUNTARY PARTS.

These are, an unnatural action of the brain, producing particular morbid states of mind, irregular action of the heart, &c. ; and these proceeding from the parts not obeying the action of their natural stimuli.

IRREGULAR ACTIONS OF ORGANS OR WHOLE PARTS.

All muscles should act in consequence of the application of their stimulus, but these sometimes take on action without any stimulus: this kind of disease taking place in involuntary parts, is of great importance. Every organ is composed of different parts, performing different actions, which actions must be performed in regular succession; and where they do not act in that regular succession, there is disease produced.

HUMOURS.

This word has been introduced to express a state of the human body, both metaphorically and literally. The first sense of the word is applied to a state of the mind; the literal sense means to express extraneous matter in the blood, as when it is said, such and such a humour is in the blood; and again it is used for the blood itself, as, the whole mass of humours is corrupted: nothing can be more vague than the meaning conveyed by this term; nothing can be more unphilosophical than to make use of a term so indefinite. Particular humours, or extraneous matters, may even exist in the blood, without producing any specific disease. In the following experiments no sensible effects were produced by them.

First, a weak solution of sea salt; second, two drachms of Glauber salts; third, as much salt of tartar as would be dissolved by an ounce of water; fourth, two drachms of sal rochel, and that repeated in the same animal; fifth, borax one drachm; sixth, vinegar diluted; seventh, vitriolic acid; eighth and ninth, muriatic and nitrous acid: these were diluted to the same strength as the vinegar and water, and were injected into the crural veins of different dogs, but without occasioning any visible alteration in the dogs: hence it appears that many substances of considerable power may be in the blood without producing any effect; but if the strength of these is increased, then they excite actions of the constitution by their irritation, but no specific disease, or permanent action, producing effects only similar to what may be caused by external accidents: thus all the above saline injections were tried of a greater strength, and killed the animals by their too great stimulus. Many substances will, indeed, produce effects, when mixed with the blood, similar to those caused by them in the stomach: thus, opium injected into the veins of a dog, made him convulsed, and, in a greater quantity, deprived him of the use of his limbs. Two spoonfuls of gin produced very intoxicating effects; two spoonfuls of laurel-water occasioned contraction of the animal's limbs. An infusion of Ipecacuanha produced sickness directly, even before I could suppose it could have reached the heart; and a scruple of jalap, in infusion, produced sickness and purging.

But this is not common to all substances, for Glauber's salts, in the first class of experiments, produced no effect on the bowels, and rhubarb only increased the flow of

urine, and gave a strong smell of it from the chest of the animal when opened. Abbe Fontana has been making a variety of experiments of this kind; but they are not worth a pin, and that owing to his not having a knowledge of this fact, that air thrown into the vessels kills; for after I discovered this, I went over all my experiments again, and found very different results when I injected no air, which before that had been frequently inserted. The serum of a blister which had arisen spontaneously on a person in a putrid fever, was injected into the veins of a bitch, and produced no particular effect, except that she lost her puppies which she was big with. The poisons which produce specific diseases are not similar to what has been termed humours. The appearances in what is called a surfeit, perhaps, are exactly similar to what has been supposed the effects of a humour; but this is a consequence of no humour, but a particular mode of action produced by a particular stimulus acting on the stomach, which I have also seen produce a violent inflammation of the heart and lungs, which followed the drinking of cold water when overheated. In considering the whole mass of blood in a bad state, there may be some cases where this may exist; but whether that, or the disease of the solids, be the primary, we know not for a certainty.

HEREDITARY DISEASES.

Hereditary principles are such as may be communicated by a parent to its child, and, according to the common idea, are of two kinds, natural or diseased; but I say the last is not hereditary in all its causes, requiring to be brought into action by some exciting cause, which is not hereditary. First, a true hereditary principle must be unalterable by any external circumstances; such is the property of producing the same species, the sexes, &c., to which may be added, varieties of shape and colour, as also an hereditary susceptibility: these are all true hereditary principles, and will take place independent of any external circumstances. Monstrosity may be hereditary, and also alterations in consequence of differences in the parents; thus if the two are similar, a third similar will be produced. Peculiarities will be sometimes lost for one age, and then return; thus a child shall be more like its grandfather than its father.

The second are those which require an immediate external cause to bring them into action; these are such as give a susceptibility, but require this external cause to bring into disposition and action, and here it is only the susceptibility which is hereditary, the immediate cause being accidental; and where this is the case, the disease cannot be said to be hereditary. This external immediate cause has been overlooked, and the whole disease termed hereditary, whereas it is impossible for a disease to be hereditary when one of its causes is not. A man may be hereditarily irritable, but not hereditarily put in a passion. Hereditary susceptibility may be in some so strong as to require a very weak secondary cause to produce the effect. Hereditary susceptibility and disposition must be much more permanent than those which are not. Fluctuating dispositions cannot be

hereditary. Set it down as a fact, that some have a greater susceptibility for one diseased action than another, and therefore may run into this diseased action with what would not affect another; and then this immediate cause would be hardly observed, the hereditary disposition being only attended to, and is therefore thought sufficient to account for the disease. The scrofula has been termed an hereditary disease; but it is only a disposition to act when excited by the immediate external cause. The gout also has been supposed hereditary; but we find the gout attacking some whose parents have, perhaps, from all eternity, been free from the gout; as is the case where luxuries are introduced where they have not yet been known, or where the native of such a place is removed to where luxuries are abundant. There are, indeed, instances where the children of gouty parents have had it very young; but when we consider that children take on early the habits of living which their parents have been accustomed to, this exciting cause, where it is allowed that an hereditary susceptibility might exist, will give no difficulty to account for this occurrence. And, on the other hand, there are diseases equally hereditary, which have never been so esteemed, because the hereditary disposition has been overlooked, the exciting cause being so plain; thus it must be allowed that the small-pox is as hereditary as gout and scrofula, we being born with a susceptibility of its particular action; but this part is but little attended to, as the effects of the exciting cause or virus are so evident. In the venereal disease there is a natural susceptibility for it; and for this and the small-pox a much greater disposition in some than in others; and hence many families have it worse than others. I do not know that we have an instance that the having had the diseased action actually brought on, renders the parent more likely to communicate the disposition, than if he had had the disposition only; if that were to be the case, what must be the consequence? why, as the disposition would increase with each succeeding generation, the small-pox, lues, &c. must have been by this time incurable, whereas they are thought to be on the decline. Madness does not seem to agree with the above: it seems to be really hereditary, the action seeming to be often put on without any external exciting cause. It must be noted, that I am not speaking of delirium with fever. J. Stuart, Esq., informed me, at this lecture, some years ago, that he had paid much attention to the diseases of the Indians, and never knew one mad.

OF SYMPTOMS.

A symptom is a sensible effect of a diseased action. The first mode of sensation is where the disease is shewn directly, without the medium of any other reference, and is known only to the patient: of this kind is pain. The second is, where it is given by a reference to some other sense, as that of touch, smell, &c., and is common to the patient and to others: of this kind is the swelling of tumours, redness of inflammation, &c. The third arises from a deficiency of sensation, and can only be known to the patient himself. It is by description, and the second set of symptoms, that the practitioner receives his

information. Pain is a very common symptom, and, though a simple sensation, is still divisible into different kinds, as sharp, sore, and heavy or numb. The sharp pain is that from cutting ; the sore, as in inflammation and ulceration ; the numb, as in rheumatism. The sharp and sore seem to be somewhat alike, depending on very quick vibrations ; the numb or heavy pain seems to be produced either by vibrations continued, or else so quickly repeated as not to be singly discovered ; but the last seems the most probable.

DISAGREEABLE TASTE AND SMELL.

These, when symptoms of disease, are not always a sign that the saliva or mucus is altered in its qualities, but the sensation sometimes is produced by the diseased actions of the nerves of the part, as a sensation resembling that from light or sound may also be produced by disease. Neither susceptibility nor disposition can produce a symptom,—it must be produced by action ; disposition though, I believe, will produce that indescribable state which sometimes exists just before actual disease takes place. This more particularly takes place before the coming on of such disease as I term an act of the constitution, as gout, &c. Symptoms are local, as cancer, chancre, tumour, &c. ; universal, when there is universal action, as in fever and hectic. Local symptoms may produce universal ones, and these again may give rise to additional local symptoms, which sometimes cure the former. Local may be affected by universal, either increasing the local or curing the disease. Universal diseases will produce some of the following symptoms,—difference in pulse, alteration of secretions, as appears in the tongue, &c. The blackness of the tongue proceeds from there being some blood in its secreted fluid, as is the case also in the urine. Other symptoms of universal diseases are,—alteration in the breathing ; heat of the skin, and in the colour of the skin, which last alteration will sometimes take place very quickly. By this I do not mean from red to white, but a quick changing from its natural colour to a more dusky one ; and this, I think, from the quickness of the change, cannot depend on any difference in secretion, but seems to me to be produced by some particular action of the skin, like that of the chamelion and some lizards. Veins of the skin are enlarged by any tumour seated beneath them, as in the hydrocephalus, tumours of the breast, and of the uterus in gestation, the veins will be found to be enlarged on the head, chest, and abdomen. Anomalous symptoms include local appearances and sympathetic affections. I will now shew you, though it has no connexion with our present subject, a preparation of the parts which were concerned in the following

Case.—A man in St. George's Hospital had a hernia, for which I laid the integuments open, and then the sac, when I found that the intestine had a tendency to mortify, and had formed adhesions to the sac. These adhesions, which were newly formed, I separated, when that part of the intestine which had adhered to the sac gave way, and the excrement came out : I therefore returned the intestine, and retained the torn part to the external wound, which became the anus ; but there was still an open communication between the upper and lower part of the gut, so that, could the opening in the groin

have been stopped, the fæces would have passed the natural way. To produce this, I dissected off the skin round the opening, and then brought it into contact with ligature, compress, &c.; but this would not do, although the granulations, by their contractions (which you will have explained by and by), lessened the size of the opening. I therefore repeated this operation, hoping that, at last, I might quite close it; but all my efforts were in vain. Now, in the above case I acted like a blockhead, being ignorant of what nature was here doing; for (admire her work) she was forming adhesions of the intestines all round that mortified, whereby she would not only have preserved the continuity of the canal, but by this same process would have prevented any escape of the fæces; all which I prevented by separating those adhesions. If the case was to happen again, I should not separate the adhesions after taking off the stricture.

DELUSIVE SYMPTOMS RESPECTING SENSATION.

These often become a cause of our being led astray as to the real seat of the disease; as diseases of the liver being thus referred to the shoulder; of the testicles to the back; of the hip and loins to the knee; and even in some cases, as before observed, referring it to another person.

Case.—A gentleman complained of a pain in the hip, running down the outside of the leg and foot. Supposing it rheumatism, I gave him James's powder, Dover's powder, and volatile tincture of guaiacum, but with no good effect. He at last perceived a tumour appear by the os ischii, just at the posterior edge of the gluteus maximus (I should have observed, that opium, taken internally, gave some little ease, but chiefly when applied to the leg and foot as an embrocation). This tumour increased, and the person died. This tumor filled a part of the pelvis, and had made its external appearance at the foramen magnum ischii, and was found to be filled with coagulated blood; but the pain in the limb seemed to have been produced by its pressing on a great branch of the nerve, but chiefly, perhaps, from the great ischiatic nerve being stretched very tight over the upper surface of the tumour. Here that happened which may often be observed, *i. e.* the impression made on the trunk of the nerve gave a sensation as if the impression had been made on the extremities of the nerve. The first action of a nerve is at its extremity, and the last in the brain; and this last action in the brain refers the sensation to the part receiving the first impression; and if, after the brain has been thus accustomed to refer the sensation to the extremities of the nerves, any impression being made on the trunk, the brain receives the impression in the same point where it was accustomed to receive the impressions made on the extremities of that nerve, and therefore the mind refers the sensation to the same spot, *i. e.* the extremities of that nerve. This happens even where the part to which the sensation is referred does not exist, as a person having had a limb amputated will for a long time after refer sensations to the extremities of the fingers or toes.

INFLAMMATION.

This requires our greatest attention, being an affection the most common and extensive of any in the body. It is the cause of many effects, both salutary and diseased; producing abscesses, fistulas, diseased bones, &c; and in many diseases it is the first step towards a cure: it is a first principle in surgery. I mean to consider some of its most common causes and effects. Inflammation is produced, most probably, by an increased action of the vessels, and most probably of the smallest vessels, as an inflammation can be present in the smallest point, where none but small vessels exist: there is also increased action of the arteries leading to the part. What the particular action is, and in what it differs from the common action of the vessels, is hard to say. It may be called a genus, divisible into several species. I have divided it into healthy and unhealthy; *i. e.* by the healthy I mean, that which is found in a healthy constitution and part, and is to be considered as a restorative action; the diseased being, in every respect, its opposite. It is either simple or compound; simple, when it has only one mode of action; compound, when it has two or more. Adhesion, suppuration, and ulceration, are three effects of inflammation; and from their different effects I have divided inflammation into the adhesive inflammation, the suppurative inflammation, and the ulcerative inflammation: the last is rather an effect, it not being performed by the same vessels, but depending on the absorbents. I have placed the adhesive first in order, though it does not always first occur, the priority depending on the nature of the part, and the violence of the inflammation. It may take place in two different orders of parts; the first is the cellular membrane of the whole body, and circumscribed cavities; the second are all the outlets or external canals, as the mouth, nose, intestines, tunica conjunctiva, &c. When inflammation takes place in the first order of parts, it is most commonly of the adhesive kind; but this depends, in a great measure, on the degree of the inflammation. Suppurative inflammation may take place from two causes, either when succeeding the former, or where it is of a different kind, having nothing of the adhesive, as the erysipelatous, which seldom takes on adhesion, and may be rather termed œdematous. In the second order of parts, the suppurative takes place first; and, if carried to a great height, is followed by the adhesive. From the above it appears that three modes of action may be the result of one cause or irritation. We may have a fourth mode, resulting from a specific poison, as that of the lues, &c. In the adhesive inflammation the union proceeds from a uniting medium, which is the coagulable lymph, which is separated and thrown on these surfaces, as is evident from this observation; first, that this substance is found effused in all large cavities; secondly, when we cut into inflamed parts we find them more solid: this arises from the cells being loaded with coagulable lymph, and are become impervious to air, being cemented together. I will just remark, that this is not peculiar to this species of inflammation; for it is sometimes thrown out, forming tumours, where inflammation is not the leading cause. But the coagulable lymph suffers some alteration in passing through the inflamed vessels, which forces it to coagulate

sooner than it otherwise would, and must differ from that which exists already in the blood, for, upon examining the cavities of inflamed veins, their sides are found furred with the coagulable lymph, which has been thrown on their internal surface by the vasa vasorum. Now it must here, at the instant of its application to the sides of the veins, be in a state very different to that whilst it is in circulation ; for here it must coagulate directly, or else it would be mixed with and carried on in the blood : it, therefore, has undergone a change, partaking of the nature and state of the vessels through which it has passed. Whatever change it suffers, it seems still to retain the properties of coagulable lymph, and retains the living principle in a high degree. Common blood is also efficacious in forming this bond of union. It is not necessary for adhesion taking place that both surfaces should be in an inflamed state ; it is only necessary that one throws out the coagulable lymph, whilst the other accepts of the union. This adhesion may take place by the medium of blood, without inflammation. Extravasated lymph, producing tumour, &c., partakes of the nature of the part where it is formed, and hence the tumour, &c. is either cancerous, venereal, &c.

This inflammation (the adhesive) sets bounds to its own progress ; for the inflamed parts adhering, as in large cavities, it renders it less likely for the other parts to receive the inflammation. It also prevents suppuration, as, by its particular effect having taken place, the purpose of the inflammation is completed. It also confines the matter when formed. Inflammation often goes only to the adhesive state, which is then called resolution.

GENERAL PRINCIPLES OF SUPPURATIVE INFLAMMATION.

When the inflammation cannot be terminated by resolution, it goes on to suppuration ; and when the parts have been so affected by the adhesive inflammation that nature is not able to relieve them by the adhesion which usually takes place, it is then hurried on to the suppurative inflammation ; thus, if a wound will not heal by the first intention, it must go on to suppuration

Suppuration, in general, seems prefatory to granulation ; but this does not seem to be the case in internal canals. Spontaneous inflammations, which are to produce suppuration, are more violent than those which happen from accident, operation, &c. Thus, the inflammation of a boil is more violent than that following a cut or an amputation. And these are also more violent than those where death is produced in a part, as is the case in gun-shot wounds, wounds from caustics, &c. ; but all these differences are not easy to account for. Perhaps in the spontaneous inflammation there is more need of ulceration than in the other cases. It is curious to remark, that, in the gout nature seems to produce all the purposes and effects intended by inflammation, unaccompanied by either of these particular states of adhesion, suppuration, and ulceration ; and although the inflammation runs much higher here than in many other cases, and though attended with all the common appearances, yet no adhesions are formed here ; for the lymph is taken up, and chalk often put in its place. When inflammation arises from the irritation of the

death of a part, let that be from what it will, it is gentle, and comes on late: though sometimes, when this is the consequence of bruises, we have it come on sooner and more violent; but this happens where by the same injury which produced death on one part, such injury is produced in the adjoining parts as may cause violent irritation, not death. Caustics, if they do not act with vigour, and bring on the death of the part, speedily produce, by so much the more, irritation.

OF THE ULCERATIVE INFLAMMATION.

The third kind, or ulcerative inflammation, follows the suppurative, and is produced by the part being made actually to absorb itself, whence is produced the loss of substance attendant on ulceration, *i. e.* by the action of the absorbents of that part; and not, as has been erroneously supposed, by a melting down of the living solid. It may arise from an injury done to the solid, where the natural conformation on which the natural actions of the part depend is destroyed; or it may be the consequence of such causes as do not primarily affect the texture of the part, but materially obstruct the natural actions, whence the texture becomes altered.

OF INFLAMMATION AND ITS EFFECTS, CALLED CRITICAL.

Inflammation, following fever, is what we may see every day, and it may be observed following either common fever, or fever joined with specific poison. And these inflammations and abscesses are commonly thought to be critical. The small-pox and chicken-pox are the only instances that can be brought in proof of this, with perhaps the inflammation of the measles; but even these abscesses or pustules in the chicken and small-pox, perhaps, are not absolutely necessary as critical abscesses, as the fever from this specific poison cannot go beyond a certain length of time, which depends on the nature of the poison and the constitution; and we have very commonly abscesses formed after those abscesses or pustules which were dependent on the specific nature of the disease were past. Now those abscesses, which come on when the disease producing them is past, do not possess any thing of the particular specific nature of the preceding disease, and must therefore be common; or where the constitution possesses a susceptibility for scrofula, they may be scrofulous, but not critical, as they partake nothing of the nature of the preceding disease; and as the preceding disease has already been followed by pustules or abscesses, which, if any deserve to be termed so, certainly ought to be termed critical, we shall find that these inflammations and abscesses depend on the state of the constitution and of the part at that time, and is an effect of the simple fever, abstracted from every specific peculiarity. Fever is, at all times, a disturbed action, and which may have joined with it a specific action. The inflammatory fever is, per-

haps, the most simple fever ; and the putrid fever, perhaps, is only the same fever in a constitution disposed to its peculiar actions. This opinion may be illustrated by what occurs in the small-pox, which, in such a constitution, is attended by a fever of a putrid kind, whilst in another constitution the fever may differ very little from the simple inflammatory fever : this difference, then, cannot depend on the specific poison, as the same poison can have but one mode of irritating. Now, since every fever is capable of producing inflammation and abscess, and as I have shewn that in specific diseases they have no right to be termed critical, they certainly cannot be supposed critical in common fever. Inflammation may arise from four causes, which may be termed remote : first, violent external causes, destroying immediately the texture of the parts ; secondly, some irritations, which do not directly destroy the texture, but the natural actions, as friction, blisters, pressure, heat, and cold, &c. ; for even cold, which produces first of all sedative effects, if continued to a greater degree, by obstructing the natural actions of the part, produces irritating effects, calling up the vital powers to rid the system of this cause, obstructing the natural actions of the part ; thirdly, a particular disposition in the part itself, producing inflammation, as boils arising spontaneously, the constitution being healthy ; fourthly, some affection of the constitution falling on some particular part, that part seeming to take on the action of the constitution, as the gout attacking the great toe, and inflammation following fever ; but this last is generally scrofulous, and therefore referrible to the second head.

OBSTRUCTION THE CAUSE OF INFLAMMATION.

This was long considered the only direct cause of inflammation, but is, I believe, now pretty generally rejected : it was too mechanical ; it was making every inflammation alike. It has, on the other side, been said, that inflammation cannot arise from obstruction to the passage of the blood ; but I say, that either the stagnation, or the cause producing it, will produce such irritation as will be followed by inflammation, and this not to propel the blood on which is thus detained, but to get rid of it by suppuration as an extraneous substance. The immediate operation of these inflammations cannot be called a disease, though their remote causes may, as those produced by small-pox, &c., as they may arise from the action of the part being only disturbed, and hardly exceeding the idea we have annexed to that of being disturbed. Those constitutions in which the adhesive and suppurative inflammations occur are generally the healthiest ; and in those healthy constitutions we shall find, an inflammation and suppuration, with very little sympathetic fever or disturbance in the constitution ; thus, after an amputation of a leg or arm we shall find a kindly inflammation and suppuration come on, with very little disturbance in the constitution. Specific inflammation, as well as simple inflammation, partakes of the nature of the constitution. Some constitutions are more disposed to some specific actions than to others ; and will fall into that specific kind of inflammation, as the erysipelatous, and every aggravation is an aggravation of the specific

nature of the inflammation; thus it happens with scrofula, cancer, &c The plague, putrid fever, &c., always change the constitution to their own nature: it is not here a specific joined with simple inflammation, but a thorough change in the constitution. The inflammations produced are always as the constitution, the nature of the part, and of the specific poison; thus, in a healthy constitution, a chancre is an example of simple and specific joined; but if the constitution is disposed to erysipelas, then we may have joined with the former the erysipelatous inflammation, when it will spread exceedingly over the whole penis. Now in this case we must make use of mercury against the one, and the bark against the other of these specific actions, until we bring it to the simple ulcerative inflammation, when it returns to its proper limits. Again, in the small-pox, when simple, the pustules retain their specific distances; but if it is joined with an erysipelatous inflammation, it becomes of a confluent kind. In the irritable constitution we find, from continued sympathy, the inflammation will extend itself very far; but in general we find very considerable inflammations confine themselves very much. Some parts are more susceptible of one kind of inflammation than of the others, some admitting only of one kind, some two, and some all three.

DIFFERENCE FROM SITUATION.

The deeper seated, especially the vital parts, very readily admit of the adhesive, but do not so readily pass into the suppurative; but if the inflammation comes on with considerable violence, it will soon pass through the adhesive, and run into the suppurative; and in this case we may sometimes have the erysipelatous added.

But it may be observed of all the parts of the body, that the deeper seated are much less liable to take on the suppurative than those which are nearer to the surface; thus, extraneous bodies, if deeply seated, will remain a long time inactive, inclosed in a cyst, as happens with pins, needles, or bullets; but as soon as they arrive near to the surface, suppuration takes place. It is very remarkable of the cattle which feed in the bleaching fields, who are always found, upon examination after death, to have considerable numbers of pins in them. (Mr. Hunter shewed part of the stomach of one, which had several pins in its villous coat, and also a nail.) Perhaps this does not depend entirely upon the situation of the part, but also in the degree of irritating power possessed by the extraneous substance; thus metals, and glass more particularly, seems to produce such a disposition in the part that it becomes satisfied with adhesive inflammation. This insensibility in deep-seated parts to extraneous substances depends on a sac being formed around these substances, possessing a particular degree of insensibility. Nature acts here with her usual care, preferring the least evil, by securing the extraneous substance in a part possessing particular insensibility, rather than calling up the vital powers to produce suppuration, which must be considerable to reach the surface, and might expose parts which might be attended with danger. External inflammation generally exceeds the internal in degree, extent, &c.

Mild continuation of symptoms of a former violent disease is generally called weakness; thus a gleet, fluor albus, diarrhœa, &c., are called weakness; none of which I conceive to arise simply from weakness. Weakness, I believe, seldom or never becomes an immediate cause of disease or action, but often becomes the predisposing cause, as of ague, scrofula, &c.

THE ORDER OF THE INFLAMMATION INVERTED.

I HAVE before made a division of the parts in which inflammation may be produced into two orders; the first, the cellular membrane of the whole body and circumscribed cavities; the other, the outlets, ducts, canals, and all such parts as are lined with what has been called mucous membrane. I likewise observed, that inflammation proceeded in this order, adhesive, suppurative, and, lastly, ulcerative. The first order of parts generally takes on the adhesive first, and proceeds regularly through the other stages. But in the second order of parts the order of the inflammation seems to be inverted, as may be instanced in internal canals; and here it is to be noted, that the difference is very great between internal cavities and internal canals: in the canals, &c., adhesions would be attended with very ill effects; and here we find the inflammation begins first with the suppurative, if the inflammation is even slight; and this takes place directly, not being retarded by the adhesive going before; thus it happens in the gonorrhœa, colds, &c. It has been said, that these discharges were not purulent; but, in my opinion, they certainly are; for these are produced by a particular secretion from inflamed vessels, as well as matter; and their differences in thickness or thinness, opacity, &c., may be produced by the difference in degree of inflammation. A similar difference is to be found in discharge of matter from ulceration. If the erysypelatous action should come on here (in the second order of parts), then it moves from the suppurative to the ulcerative, the coagulable lymph is thrown out, but differently from what takes place in the erysipelas in common. When the ulcerative inflammation takes place, it is from the stimulus of the coagulable lymph effused on their surfaces, and ulceration takes place where the patient has been weakened, the weakness being the cause in those cases. It is to be remembered, that in the first order the inflammation begins with the adhesive, and goes on to the suppurative; but in the second, begins with suppurative and goes on to the ulcerative.

STRENGTH AND WEAKNESS

OF the constitution, or of the part affected, will produce very different effects in inflammation. Strength produces good effects, and renders the disease more manageable; for strength very much lessens irritability. Inflammation is most manageable in muscles, cellular membranes, and skin; and the more so the nearer the source of circulation. In other parts, as bones, cartilages, ligaments, &c., which have but little power in

themselves, are much less manageable, although the constitution be good, for it appears that the constitution feels a consciousness of the weakness of these parts, by which affection of the constitution they become farther weakened. In the vital parts, inflammation is still less manageable, although these have power in themselves ; but in consequence of their being affected, the universal health is destroyed, and hence the disease less manageable. If the stomach is affected, or those parts with which it strongly sympathizes, the disease is still less manageable. The operations are also more backward, or otherwise, in their effects, according to the nature of the parts affected.

STRENGTH IN THE CONSTITUTION, AND PART AFFECTED,

When under inflammation, is productive of the following effects ; viz. a more ready and quick termination, whatever termination it be : thus a wound in a healthy constitution unites more readily by the first intention ; the adhesive inflammation is more likely to terminate sooner by resolution ; and in this state of constitution, if the inflammation has got beyond the first stage, it passes sooner on to the suppurative inflammation, and the matter is also sooner brought to the skin by the ulcerative inflammation ; nature going through her operations with greater facility and dispatch in such a state of the constitution or parts.

WEAKNESS IN THE CONSTITUTION, &c.

When a wound is made in a weak habit, the union is more difficult, and the inflammation is more likely to continue ; and this not from there being a greater disposition to inflammation, but from a want of power and disposition to heal, nature needing greater and longer exertions to produce the intended effect. In this state of the constitution and parts the diseased parts seem to be hardly capable of taking on either the adhesive or suppurative inflammation, but they do continue a long time inflamed ; and in some of these habits no inflammation will follow even a solution of continuity : this is particularly noticed in dropsical cases ; and I have observed, after perforating the abdomen with a trocar, and after scarifications, a degree of inflammation has, indeed, taken place, but not sufficient to produce a healing of the wounds or suppuration, and after a short time mortification has ensued.

All parts do not admit the three different inflammations with equal readiness ; the difference appears to arise from the situation, and also from the nature of the parts inflamed. Cellular membrane, free from adipose matter, is more susceptible of adhesive inflammation, and more readily passes into the suppurative. Deeper seated and vital parts readily admit the adhesive, and not so readily the suppurative. When in these parts it comes on with great violence, it passes to the suppurative at once. This may be from erysipe-

las, though erysipelas is not disposed to suppurate; but I suspect erysipelatous inflammation in some degree reverses the common order of inflammation, making deeper seated parts suppurate more readily than superficial: the membranes of the brain have something of this disposition. Inflammation is greater on the side next to the external surface of the part than the centre: the specific qualities in diseases also tend more readily to the skin.

THE EFFECTS OF INFLAMMATION ON THE CONSTITUTION.

The sympathy of the constitution with a local disease is, perhaps, the most simple of any: this will vary with the constitution, and with the stages of the inflammation; and I can easily conceive that this may rouse up some peculiarity in that constitution which may again affect the local disease. The effects produced on the constitution are varied: first, by the nature of the constitution; secondly, by the nature of the inflammation, whether common or specific, and, if the latter, its specific kind; though I believe specific inflammations produce but little varieties, except the plague, which entirely changes the constitution, and such as, by their long continuance, produce a change in the constitution; thirdly, the nature of the parts inflamed, whether vital or otherwise; fourthly, the situation of similar parts, as being in the arm, or the leg.

OF THE KIND OF CONSTITUTION LEAST AFFECTED BY LOCAL INFLAMMATION.

As this affection is the effect of sympathy, it must be in proportion to the disposition the constitution has to go into sympathy; the kind of constitution, therefore, the least affected by the inflammation is that which is most healthy and least sympathizing, where the affection of the part is not made known to the adjoining parts. The constitution may be affected by the part affected wanting power to cure itself, of which the constitution feels a consciousness, which must again weaken the action of the part. The nature of the cause of the inflammation produces very little variety in the effects on the constitution, these being varied in this respect only by the degree of violence and rapidity of the progress of the inflammation.

THE NATURE OF THE PARTS INFLAMED.

The different effects which the inflammation of different parts have on the vascular system, which is discoverable by the pulse, are very remarkable. Now, before we examine this, we must consider that the pulse depends on the action of two powers, that

of the heart and that of the artery, and of both together. The quickness or slowness, regularity or irregularity, depends on the heart; the hardness, vibratory or tremulous, fulness and smallness, and slowness of its systole, belongs to the artery. The pulse may be natural or diseased. In most diseases of the constitution, whether original or sympathetic, the pulse is altered; and, according to those affections, it is one of the first modes of intelligence we have of the disease. We have many varieties of the pulse, as of its number of strokes being quick or slow, hard or soft, full or small: the alteration may be in its systole or diastole; these do not depend on the quantity of the blood so much as on difference of irritability, giving these differences of the diastole in the heart, and of the systole in the artery. The quick, hard, and vibratory pulse is an attendant on inflammation, and will depend on the affection of the parts producing more or less irritability, the blood being passive; but it is found different from healthy blood.

DIFFERENT PARTS PRODUCE DIFFERENT SYMPTOMS.

In inflammation of common parts, as the skin, cellular membrane, muscles, &c., the pulse will be full and strong, and symptoms acute, especially if near to the heart. Ligaments, cartilages, tendons, and bony parts, produce symptoms which are less acute; the pulse is not so full, but quicker, there being, in these cases, a greater degree of irritability. In the vital parts of the second order, as the brain, the pulse is quick, but full; but in the stomach and parts sympathizing with it, as the testicles, upper part of the intestines, &c., the pain is depressing, and the pulse small, quick, and hard.

OF THE SENSATIONS FROM INFLAMMATION OF DIFFERENT PARTS.

When injury is in the head, the pain is often dull, and attended with sickness; when in the heart or lungs, the pain is more violent. When in the stomach, or upper part of the intestines, it is a heavy and depressing pain, and attended with more or less of sickness. When in the colon, it is more acute, but attended with less sickness. When the liver, ligaments, bony parts, &c., are affected, the pain is much the same as when the stomach is affected, *i. e.* heavy and depressing; the skin, cellular membrane, and muscles, yield an acute rousing pain. Inflammation in all the vital parts does not produce the same sensations; and this seems to depend on the difference of their sympathy with the stomach; but it is certain that a given quantity of inflammation in a vital part, or its sympathizer, will produce much more considerable effects than a greater quantity in another part, and the blood is more sizy. When in the heart, the pulse is irregular, and the pain acute; when in the lungs, the pain is not so acute. If the stomach and upper intestines are inflamed, the patient feels a considerable oppression, animal life seeming to be lessened as the sensation increases. The pain of the colon is more acute and rousing. The uterus yields an acute pain, the pulse being quick and

small; the testicles a depressing pain. In the stomach, and all its sympathizing parts, as the uterus, upper intestines, testicles, &c., the symptoms come on with great rapidity, and, if fatal, it runs through its stages very fast, debility beginning very early: all this may depend on the stomach being, as it were, the seat of sympathy. However, universal sympathy takes place here very readily; and the sympathy being similar to the first action, a fever of a depressing kind is produced. But if the part inflamed is not vital, and the inflammation is so considerable as to produce universal sympathy, this fever is of the rousing kind, and the action of the parts is also excited: but there may be difference in the symptoms, depending on the constitution; thus, although the blood may be sizy, it may be also loose in its texture. Different effects may arise from difference in situation of similar parts: thus there is a great difference between the upper and lower extremities.

DIFFERENCE FROM DIFFERENT NERVES.

One cause of the different effects produced by the affection of parts which are vital, or not vital, seems to be the different system of nerves by which they are supplied; for all those parts which are supplied by the par vagum affect the patient with lowness from the first; the nerves from this supplying the parts of involuntary motion, and therefore possessing the living principle in a high degree, whence an inflammation of these parts becomes peculiarly depressing.

OF THE SITUATION OF THE BLOOD IN THE COMMENCEMENT OF MOST DISEASES.

In some diseases the blood, in the commencement, seems to shrink from the surface, and retires towards the heart; and in all those cases there seems to be debility, so that the powers are called to the citadel, and the outworks left: as in the cold fit of ague, and in the hectic. This does not, though, appear to arise from actual debility in the constitution, but from a novelty of action, and a debility in that action only.

EFFECTS ON THE CONSTITUTION BY DIFFERENT STAGES.

The constitutional effects are different, according to the different stages of the inflammation; thus, in the adhesive inflammation, very little difference is discoverable: the suppurative produces much more alteration. Rigors and hot fits take place, proportioned to the nature of the part and the degree of the disease. These cold fits are constant symptoms of injury done to the constitution, as in the commencement of fever, absorption of poison, &c. I have seen them from the prick of the finger with a sewing-needle.

They may be produced by disagreeable sensations, and by disagreeable states of the mind. It is probable that the stomach, from its being the seat of sympathy, and more universal in its sympathy, has some connexion with this, by taking part with the constitution, as this viscus sympathizes in every constitutional alteration ; and we observe how much this viscus is affected by loss of blood, disagreeable sights, &c. What nature expects by this connecting sympathy with the rest of the body is hard to say ; but this is certain, that the act of vomiting, when excited by any alteration in the constitution, may, by calling up the powers of life, answer some salutary intentions. Rigors seem to proceed from a sudden call on the constitution, from that weakness which must be the effect of new action. In a strong constitution, and where the disease is manageable, it calls up the vital powers into action, which carries off the disease: but in a weak constitution there is much loss of power by each rigor ; and these will be followed by no hot fit, but only, perhaps, a little sweating.

Case.—A boy was attacked with rigor, followed by sweating, and he afterwards continued getting, sensibly, worse and worse: pulse quick and full, blood sizy, tongue white. He was worse every other day. After being ill about a fortnight, he was again attacked with rigor, hot fit, and sweating ; which, contrary to my expectation, who supposed these would be repeated, it carried off the disease with that single fit. I think I have seen other cases where nature has attempted something like this, but has failed. In many diseases the rigor is the first apparent symptom, and is followed by a hot fit, and then sweating ; and, when these whole actions of the disease have taken place, the patient becomes well : but this is not the case where, from weakness, &c., the whole of the regular actions do not take place ; but, as at the commencement of the boy's case above related, the hot fit does not succeed the rigor, when he continued ill afterwards, until nature took on again the rigor, and was able to go through the stages regularly, when one fit carried off the disease. The boy abovementioned was a striking instance, likewise, of a crisis of a disease being similar to its commencement. Rigors, from the affection of a local kind only, are seldom followed by hot and sweating stage. Ulcerative inflammation does not seem to affect the whole constitution to the degree produced by the others ; but yet rigors do occur at the commencement of ulceration, but, happening so near to those of the suppurative, it is difficult to distinguish them. But we may observe them more distinctly in cases, where suppuration having taken place, and a small opening being made ; if, after a little time, nature finds this opening not sufficient, it endeavours to make another, which it does by a part of the tumour taking on the ulcerative inflammation, at which time a rigor is frequently produced, which is generally ascribed to the formation of more matter.

EXACERBATIONS

Are other symptoms which have a great affinity to the foregoing (rigors), and are common to most constitutional diseases, and to some local ones. They are repetitions

of the first attack, but seldom so strong as the first, except where there has been an interruption of the first. These have been supposed to be owing to the disease acting on the constitution at stated times, but we must search for some principle in the animal economy to account for this; for we cannot suppose an increase and decrease of the cause of the disease so as to account for it. Now an animal cannot exist in one state for a long time together; life cannot always be affected in the same way.

OF THE STATE OF THE BLOOD.

It is reasonable to suppose that the blood is affected by disease as well as the othe parts, the same living principle running through the whole. When there is too great action of the solids, the blood separates more easily, when taken out of the vessels, and coagulates more quickly, the upper part of the coagulum being of an opaque yellowish white, in which state the blood is said to be sizy; and it is also of much firmer consistence, in consequence of the red particles subsiding to the bottom of the coagulum, allowing a more complete coagulation of the coagulable lymph. That I can conceive the death of the blood, and that independent of that of the solids, I have before stated; and I have to observe, that the diseased state of the blood, of which we are now treating, appears to me to be as capable of coming on as suddenly as the corresponding state of the solids.

Case.—A man received a stab in the abdomen. I saw him a little time after the accident, when there was no degree of fever or constitutional affection, but he complained of considerable pain; I therefore took away some blood from him, which was entirely in a natural state: in about a quarter of an hour constitutional disposition came on, and, upon bleeding, the blood appeared very sizy. Whether this effect proceeds from an increase of the living principle, or whether it results from an increased exertion of what is already present, is difficult to say.

Although the appearance of the blood will, in general, agree with the state of the pulse, yet this is not always the case; but sometimes, when the pulse is hard, quick, and vibratory, the blood will be found sizy; but when we have neither hard nor quick pulse, no fever nor any inflammation, and, perhaps, only some considerable symptom, such as violent pain, shifting from one place to another, we shall find the blood become sizy, even in this case.

Case.—A gentleman who had no fever, pulse small and slow, had violent pains, shifting about from one place to another, desired to be blooded; the blood was rather sizy. After the bleeding the pulse became quicker, harder, and fuller, and did so after every bleeding; which, on account of this circumstance, and the continuance of his pains, was repeated several times. Something like this is often observable where an oppressed pulse has been liberated by bleeding; but, what was remarkable here, was its increasing in hardness.

THE MANNER IN WHICH INFLAMMATION BEGINS.

In most cases it seems to begin at a point, and thence diffuses itself, according to the disposition of the surrounding parts: the inflammation is highest in that first point, and becomes weaker and weaker as it gets farther from that spot, until it is insensibly lost in the unaffected parts. This diffusion of the inflammation, as I have before observed, is owing to sympathy; and hence, according to the susceptibility of sympathy, will be the spreading; and from the difference of disposition to sympathy will result great difference as to the diffusion of the inflammation: the more healthy, the less the sympathy.

SWELLING OF THE PARTS

Is an effect of the inflammation, and, as was observed of the inflammation itself, is greatest in the middle point, and gradually lessens from that until lost in the surrounding parts. The cause of the swelling is from the extravasation of coagulating lymph and of serum; the serum, as the coagulating lymph thickens, being squeezed out of it, and deposited around the inflamed part, producing œdema in the parts immediately surrounding the inflammation; and in proportion as the parts are healthy, this œdema is less.

COLOUR OF THE INFLAMED PART.

This is of various hues, according to the nature of the inflammation and constitution; the nearer it approaches to health, the brighter scarlet it has; and the more unhealthy, the more blue it appears. This colour depends on a greater quantity of blood being contained in the part than is natural to it, from the red blood passing into vessels which did not naturally receive it, and from new vessels being set up in the extravasated coagulating lymph. The true inflammatory colour is scarlet, the colour of the blood whilst in the arteries; hence we may conclude, either that the arteries are principally dilated, or that the blood does not, in such inflammation, undergo any change in its passage from the arteries to the veins.

HEAT OF THE INFLAMED PART.

The part becomes hotter than common; but this is most discoverable when in the skin, and this from its being an organ most accustomed to carry these sensations to the brain. I have already treated of the natural heat of animals, and now will examine it as increased in this disease. The heat is greatest in the strongest constitutions, although it may be the consequence of exertion in a weak constitution. Whether every

part possesses this property of generating heat, or whether there is a principal source of heat, is difficult to determine, but that there may be a principal source of heat I am ready to think; but I do not think, with many, that it is in the blood, but I should rather suppose it to be in the stomach, more especially as derangement of the stomach, occasioned by taking various substances into it, produces heat and cold in the body, and as several morbid affections of the stomach produce the same effects. The cold bath, and various affections of the mind, indeed, produce similar effects; but even these, I think, are produced by the stomach sympathizing, and becoming thereby so affected as to produce this effect. Whether the increase of heat is from an increased power, or from an increased exertion of the same power, I know not: inflamed parts do certainly become hotter, but not so hot as may be supposed. I do not find, by experiment, that the heat of the inflamed part exceeds, or always attains, the natural heat near the source of circulation. A man had the tunica vaginalis laid open for the cure of the hydrocele. I introduced a thermometer into the wound, and placed it in contact with the testicle, when it stood at 92°; at night it rose 98¾°, a rise of 6¾°: but this is not greater than the heat of the blood at its source of circulation. A wound was made in the abdomen of a dog, and the bulb of the thermometer immediately applied to the diaphragm, which gave 101°, and did not increase above that. Another dog's rectum gave 102°, and, after an injection of sublimate, which inflamed it very much, the heat was not increased a degree. The rectum of an ass, 98°, was injected with a strong infusion of mustard and ginger, several times repeated, but did not increase the heat at all, nor did a strong solution of sublimate; and, at last, a much stronger solution was injected, which brought on a very violent inflammation; but the heat was only increased to 100°. A similar experiment was made, with nearly the same result, on the vagina of the same ass. Also a wound was made deep in the gluteus muscle of the same ass, and in no stage of this wound did it even raise the thermometer above 100°. A wound was made in the abdomen of the same ass, and an injection of a strong solution of common salt thrown into the abdomen, which produced a violent inflammation, and even symptomatic fever; yet the heat of the part was very little altered. But that, in some instances, the heat of the parts may be increased beyond its natural degree, in those parts which have the greatest natural heat, is certain, from the following experiment: the bulb of the thermometer being held in the stream, flowing from the abdomen of a man tapped for the dropsy, raised the mercury to 104°. There seemed to be in most of the above experiments a difference of 1° between that of the night and that of the morning; and this difference seems to exist in the natural state of the body. I suspect that the blood has an ultimate standard of heat in itself, when in health, and that nothing can increase that heat, but some universal or constitutional affection. The production of cold is certainly an operation which the more perfect animals are endowed with, both constitutionally and locally, similar to the power of producing heat.

COLD FROM DISEASE.

I SUSPECT this arises from weakness, or the consciousness of weakness, in the constitution, joined with perhaps a peculiar action. That weakness, and the feeling of weakness, produces the sensation of cold, is evident, as in faintings, &c.; and that constitutional change, producing cold, may arise from the stomach, is also evident. I threw three grains of emetic tartar into the stomach of a bitch, and repeated the experiment with a grain more: she vomited and strained very hard, and brought off a good deal of froth, *i. e.* mucus of the stomach, mixed with air in coming up. I opened her body, and, contrary to what we generally observe, I found the intestines, liver, and heart, not warm. Coldness, produced by affections of the mind, is doubtless through the sympathy of the stomach with the mind, the sensation beginning in the stomach, producing there such a sensation as we mean by turning the stomach, with sickness: the sensation proceeds to the shoulders, which, with the rest of the body, are put into motion by what we term a shuddering.

PAIN ATTENDING INFLAMMATION.

THE immediate cause is an alteration in the natural situation of a solid, arising from some violent action, or from mechanical or chemical injury, joined to its being produced in a given time; for the action may be either so slow, or so quick, as not to keep pace with the sensation. In the adhesive state it is generally not very considerable, and is perhaps more of a heavy than an acute pain; but when it is passing from the adhesive to the suppurative, then the action suffers a considerable change, being much increased, the pain becoming more and more acute; and perhaps the nerves, with what they have suffered, become more irritable, and communicate more acute sensations than before. To account for the pulsatory kind of pain, we must consider that every muscular part is capable of feeling the greatest pain when in a state of contraction, hence the arteries at the instant of contraction have their pain increased.

THE SUBSIDING OF INFLAMMATION.

WHATEVER the disposition, and whatever the action may be which has taken place, this is certain, that the parts may become red, and swelled even, tending to the adhesive state of inflammation; and the same may be produced by external violence: and even in this state a resolution may be had, by the proper use of means, cessation of pain, attendant on resolution as well as on suppuration, taking place. Why inflammation of any kind should stop, when once begun, is difficult to explain, except from the nerves

adapting themselves to the irritation, and requiring, therefore, a continual increase of the irritating cause. In this way we might account for its progress being stopped, on the idea of the irritating cause not increasing in the proportion in which the nerves had lessened in their acuteness of sensation ; but this will not account for their going back to their former easy state, unless we suppose the removal of the original cause sufficient to the cure, on the supposition, that it being removed, they could not remain in the state they had been raised to ; then we must suppose that the parts are like a spring, always endeavouring to return to their former state, their diseased state having been a forced one.

RESTORATION OF INJURED PARTS.

Having gone through inflammation generally, we proceed to a few particulars respecting it ; but must first make some general observations on injuries.

I have before observed, thatactions are preceded by dispositions, and thus preternatural actions, in consequence of injuries, may be caused by, first, a disposition to restoration, in consequence of injuries, which is the most simple ; secondly, a disposition of necessity, whence ulceration, &c. ; this is rather more compounded : thirdly, the act of disease, which is much more complicated. There are a great many cases requiring the assistance of a surgeon, but which cannot be strictly called disease, but are injuries done to the body. In disease there is a disposition to wrong action, which goes on until worn out, or is put a stop to by remedies ; but the actions in consequence of accident are widely different ; for here, by reason of the stimulus of imperfection in the injured part, a disposition to restoration is excited, and action, different from the former, comes on. In disease, the restoration of health is by a prevention of the continuance of diseased action ; in injuries, or alteration of structure by violence, something is required different from the ordinary and natural actions, which will differ, in some respects, according to the nature of the violence and of the part ; and this alteration is an action of the most simple nature, being the action in consequence of a disposition to restoration ; and, consequently, if it wants any assistance from art, requires the most simple. Affections, in consequence of accident, may be divided into those which are in sound parts, and those which are in diseased parts. The first I shall take notice of here ; and these I divide into, first, those accidents which do not communicate externally ; these are bruises, sprains, ruptures of tendons, simple fractures, &c. : secondly, those which have an external communication ; such are wounds, compound fractures, &c. Bruises which have destroyed the life of the part may be considered as a third division. The first class, when in a simple state, requires a most simple treatment, but may be so complicated as to need our utmost exertion. The most simple of these injuries is the bruise, when the continuity of the parts is not broken in upon : here the parts have nothing to do but to recover themselves. The next simple is the rupture of some very small vessel opening into some interstice, but a difference will exist here

depending on the situation of the part; thus, if a branch of the coronary artery, or in the cavities of the brain, the extravasation may kill. The cure in this case will be next in simplicity, the closing of the vessel being made by the contraction of its muscular coat, and the adhesion formed by the coagulation of the blood. The differences in these cases will arise from the magnitude of the injury and the nature of the injured parts. Some of this class will require the aid of art to restore them to their former natural situation; and, when thus reinstated, nature falls to work, and completes the business. Sometimes the quantity extravasated is so large, as to prevent nature from going through the above processes directly, and forms a tumour, called ecchymosis. These tumours, from extravasated blood, may be of two kinds; the one where the blood coagulates; the other where it does not. With respect to the first, but little trouble is in general occasioned by it, the extravasated blood being gradually absorbed; but it is not so with the last. I have seen where a small wound has led to the cavity containing the coagulum, which, not being meddled with, the sides of the cavity have gradually contracted, and have as gradually squeezed out the extravasated coagulum.

Case.—A woman fell with the labium pudendi on the edge of a pail. I found a very considerable tumour, which I thought was of blood; there was evidently a fluctuation. I bled her, and ordered a poultice, but did not open it: the pressure of the extravasated blood, I thought, might serve to stop the orifice of the wounded vessel. In a little time it burst with a very small opening, and, upon examining with the probe, I found the coagulum filling a space of the size of a goose's egg. The cavity grew less and less, but always kept exactly filled with coagulated blood; and thus it continued diminishing, until the orifice healed. Now, what would have been the consequence of a contrary treatment, that of laying the tumour open, and scooping out the blood? I should then have had a sore the whole extent of the tumour, and which must have given considerably more inconvenience to the patient, and difficulty to myself.

The second kind, or that where the blood does not coagulate, seldom terminates so well as the former; it often gives an appearance similar to that of an encysted tumour. The cause of the blood not coagulating arises, I imagine, from some peculiar mode of action of the vessels, in consequence of the injury received; and I suppose that, in this case, the blood dies at the moment of its extravasation. These sometimes happen in children in birth, but should not be meddled with, as they generally do well. Sometimes the injury has the effect of so deadening the skin, or so irritating the parts, as to render suppuration necessary, and here it must be treated as a common abscess only, waiting rather longer for its opening.

If these injuries are not very great, little effect will be produced on the sensitive principle, universal sympathy, producing fever, &c., not taking place; but sometimes the accident will, by its irritation, produce another action of the parts, causing inflammation, the end of which is, either the adhesion of divided parts, or suppuration for the getting rid of substances become extraneous. The most

simple accident may be attended with such circumstances as will prevent the more simple process of nature taking place; such, for instance, as the magnitude of the vessel ruptured, or a fractured rib wounding the lungs, &c. The second division of injuries from accidents is, where there is an external communication. A wound is either simple or compound; the simple I mean now to explain by saying, that it is a breach made in the continuity of a part. By a wound there are a number of vessels divided, and a variety of internal parts exposed. There are two modes of cure; the natural, and that by art. By the natural is meant, union by the first intention; when this cannot be obtained, a new bond of union, a secondary operation takes place, inflammation; and if this is lost, then a third mode—granulation. In that by art we have to imitate the former natural position of parts disturbed by the accident, and to retain them by art in that position; then nature causes the superfluous quantity of the extravasated blood remaining in the wound to be absorbed, whilst the living part forms a true bond of union for the divided parts: the red globules are, indeed, absorbed, and the coagulable lymph remaining is really the bond of union. The time of replacing the divided parts is, perhaps, best whilst the extravasation continues, but it may also be done when the discharge of coagulable lymph, and the adhesive or first stage of inflammation, takes place. Sometimes the inflammation runs so high as to get to the suppurative stage: the extravasated fluids or the solids may lose their living principle, and so become a stimulus, exciting inflammation. By the adhesive inflammation different parts of the same body may be united together, nay, parts of different bodies. Thus I shew here the testicle of a cock separated from that animal, and put through a wound made for that purpose into the belly of a hen (this mode of turning hens into cocks is much such an improvement for its utility as that of Dean Swift's, where he proposes to obtain a breed of sheep without wool); the hen was afterwards killed, and the testicle was found adhering to its intestines, as may be here seen in this preparation, where the testicle, with the part of the intestine connected with it, is preserved: and here is preserved the spur of one cock engrafted into the leg of another; this, you see, has but just taken root, as it were, but is undoubtedly united.

This is a preparation I had liked to have overlooked; it is the comb of a cock, in which was inserted the tooth of a Christian, if you please: this, you see, has taken firm root in the comb; for it being injected, you may perceive the vessels of the comb passing into the tooth. These living bodies, thus applied to each other, produce adhesive, not suppurative inflammation: in the same manner the eggs of one animal, laid in the flesh of another, do not excite the suppurative inflammation. This would not be the case if the inserted body did not contain the principle of life; for the part would run into the suppurative inflammation, as would be the case with a pea so introduced. While the guinea-worm is endowed with the living principle, it gives but little trouble; yet, if killed, it gives the stimulus of an extraneous body, which produces suppuration through its whole length.

In this preparation you see a maggot, deposited just below the skin of the back of a

reindeer : here the first stage of inflammation took place only ; coagulable lymph was poured out, which has formed a chamber in which the insect resided. A similar power is observable in vegetables. Here is an oak leaf which I picked up in my garden ; you observe on it seven or eight protuberances, exactly circular and uniform. These have been formed by the insertion of the egg of an insect into the leaf; and I cannot but think that the process would have been very different, if it had been any substance not possessed of the vital principle which had been thus inserted.

PARTICULAR OBSERVATIONS RESPECTING UNION BY THE FIRST INTENTION.

It is on this principle of union by the first intention that the bringing the parts together by suture, bandage, &c. has been recommended : but suture is forbid by the injury being such as has deprived of life some of the parts ; by there being any extraneous substance within the wound ; and by the parts being much lacerated, although laceration will not be always such as forbids it. The machine is not at all disturbed by that most simple operation (*vide* p. 5.), it being performed by the blood only, there being perhaps even no local action, except the contraction of the vessels. The coagulable lymph extravasated in the adhesive inflammation is the second bond of union ; this, as I have before observed, is not simply coagulable lymph, but is altered in passing through the vessels.

SCABBING.

In wounds from blows on the shin, which very much deaden the parts, I always allow them to scab. I have seen the parts underneath the slough cicatrize, and the dried slough at last fall off. This practice is the very best for burns and scalds after the inflammation is subdued, powdering the parts with some inoffensive matter, as lapis calaminaris, or very finely powdered chalk.

The effects of the adhesive inflammation in circumscribed cavities is that of forming adhesions between the parts containing and contained, or with each other ; and one cause of this inflammation taking place is the exposure, by an opening, of any of these cavities ; for, soon after this is done, the inflammation will come on as far as the communication with the external air reaches. But there are natural causes hindering the too wide extension of this inflammation ; for there is no such thing as an empty space in any of the circumscribed cavities of the animal, the enclosed parts being in contact with the sides of those cavities which contain them ; thus the viscera of the abdomen are not only in contact with each other, but with the sides of the abdomen : hence, if a wound is made into this cavity, the viscera, applying themselves close to the lips of the wound and the sides of the cavity are joined by the adhesive inflammation, which, taking place round the edges of the wound, prevents the communication with the external air reaching

through the whole of the cavity. The same good effect is produced by the adhesive inflammation in wounds of the cellular membrane.

Case.—A woman had the Cæsarean operation performed, and died two or three days afterward. The wound was eight inches long; the intestines and peritoneum were inflamed; the inflammation was least where the contact was most complete, and *vice versâ*, being greatest of all in the angles of the intestines, which did not come in contact with the peritoneum.—This preparation shews the lungs of a dog adhering to a wound made into his thorax, and adhering at that part only.

FURTHER OBSERVATIONS ON ADHESIVE INFLAMMATION

This seems to be nearly of the same nature, whether it arises from the constitution, from peculiarity in a part, or from external violence; its final intention being generally to repair some mischief. It is often obviously of service in affections of parts, the consequence either of violence or otherwise; and if it is the termination of a general irritation in a local one, its service is very plain. Although it is not always necessary that the adhesive should precede the suppurative, yet in circumscribed cavities, and in the cellular membrane, it is necessary to prevent bad consequences; and here coagulable lymph, with some serum, is thrown out to form adhesions, whereby the inflammation is limited in its progress. It appears from observation that some surfaces are more capable of throwing out this matter than others are, or it may be that some surfaces adhere later than others; hence the coagulable lymph is continued longer pouring out: this is very observable in inflammation of the heart. In this preparation, which is of a human heart, you see it furred thick with the coagulable lymph over its whole surface, but no adhesion had taken place. In this, which is part of the heart of an ox, here is a coat of coagulable lymph of extraordinary thickness; in one part nearly an inch thick. In inflammation the part is very red, and seems more vascular (this preparation is of a part which was highly inflamed), and is perhaps really so, having the number of vessels increased: the vessels are dilated; hence the blood passes farther into them, and into vessels which did not before contain red particles. From the appearance of the extravasation, I have suspected that parts have the power of making red blood and vessels independent of circulation. The coagulating matter on surfaces does not, however, appear to be simply the coagulating lymph, such as it is when circulating, but somewhat different, from having undergone a change in its passage through the inflamed vessels; otherwise it could not be coagulated on the internal surface of veins immediately on its separation by the vasa vasorum. In inflammation of the skin, vesications are sometimes formed, which are filled with serum and coagulable lymph, and sometimes it is tinged with blood. These seem to be produced in consequence of a weakness or the death of the parts connecting the cuticle and cutis.

The pain is not always very violent in the adhesive inflammation; but this will vary with the degree of the violence, the quickness of its progress, or its nearness to sup-

puration. But that the pain is sometimes very trifling may be gathered from adhesions in the circumscribed cavities being frequently found in subjects where there had been little or no complaint of pain. We are often foiled in our attempt at the radical cure of hydrocele, and this often by adhesions taking place, partially permitting the fluid again to collect in the intervals. In still larger cavities, where only a partial adhesion takes place, it may prevent suppuration, or, if not that, it will confine it so as not to spread over the cavity; this particularly happens in inflammations of the pleura and lungs, by which the inflammation is prevented from spreading through the whole chest: in the cellular membrane the same thing happens, the sides of the cells sweating out this connecting matter. The lungs, from their two surfaces, admit of the peculiarities of circumscribed cavities and of outlets, &c., the surface in contact with the pleura being of the former class; that of the cells of the latter. Inflammation of the one perhaps does not exist without the other being affected. We cannot, perhaps, shew the good effects of the adhesive inflammation better than by contrasting it with what takes place in erysipelatous inflammation: how far erysipelas deserves to be termed inflammation, I shall not here much insist upon, but will only just observe, that it has some symptoms common to inflammation, such as pain, heat, redness, &c.; but, again, it has appearances which are peculiar to it, these perhaps depending on its specific nature. It never seems to take on the adhesive inflammation, and when it takes on the suppurative it seems then to precede mortification.

Case.—A man was attacked with an inflammation on each side of the anus; it had such an appearance as might have been expected from the suppurative and erysipelatous joined, and had an œdematous appearance: he was bled, and the blood appeared very sizy; he took physic, and the part was fomented. The next day the inflammation had reached to the scrotum, where a fluctuation with a gurgling of air was felt. I now made an opening near the rectum, and in the scrotum, and let out a quantity of dirty-coloured matter; it continued to spread over the loins, scrotum, bottom of the abdomen, &c., where I made openings, out of which the cellular membrane hung like wet tow. In the above case of the erysipelatous and suppurative joined, the suppuration was diffused for want of the adhesive preceding or accompanying it, by which it would have been limited. But it sometimes happens that the adhesive is so imperfect that it cannot set bounds to itself, or the succeeding suppuration; hence also a reason of the diffusion of inflammation. Again, it may be joined with the suppurative from the first; also we may observe, where there is a tendency to mortification, the adhesive and suppurative going hand in hand. In wounds where, from particular circumstances, they are prevented healing by the first intention, yet good effects are produced by the adhesive inflammation; for, according to one of the fixed laws of the animal economy, the newly cut vessels contract themselves: hence no blood is discharged, only serum together with coagulable lymph; and it has the effect, even in such wounds, of preventing the too great extension of the inflammation; it also, by contracting the mouths of vessels, prevents the inflammation from running along their inner surfaces. Adhesive inflammation produces very trifling effects on the constitution. We know that one effect of the adhesive inflammation is

that of uniting parts not intended by nature to be united, which must be therefore less moveable on one another ; in fact, they must have little or no motion on one another, as occurs in the cellular membrane and circumscribed cavities : but it happens that motion is again obtained, after a time, by the elongation of the connecting part, which is effected by the repeated endeavours for motion. This preparation shews the adhesion of the lung to the pleura, which is elongated very considerably. This preparation also shews that this connection is vascular. These adhesions may possibly be the cause of many indescribable sensations, which cannot be called pain. I have already shewn, that wrong and improper action may be the consequence of impressions ; and why may not proper actions be again obtained from impressions also ? It has always been recommended, when an inflammation has been the consequence of an affection of the constitution, to encourage suppuration, if the nature of the part does not render suppuration in it dangerous to the part. If the inflammation is really a concentration of the constitutional disease, then it would be proper to encourage its stay ; but, according to this idea, suppuration is not at all necessary, because this is an effect of the inflammation, and not of the prior disease. It is the inflammation, therefore, which produces the good effects, and not the consequent suppuration ; but, on the contrary, it would appear that, by hastening the suppuration, which takes off the inflammation, as well as a cure of it by resolution, the peculiar action of the part which gives such relief to the constitution is prevented. Inflammation being very simple, its cure therefore ought to be simple ; but there are few cases where there do not exist in the constitution diseased dispositions ; hence the cure often becomes more compound. I do hardly know an instance where inflammation, from violence, may not, with propriety, be resolved and prevented from going to suppuration, except where it relieves the constitution from any prior disease : thus Mr. Foote was cured of a violent pain in the head by an amputation of his leg, but he afterwards died with a different complaint in his head. Might not the first diseased action in the head be altered in this case, and an action of a different kind induced, which proceeded to the degree of effecting his death ?

TREATMENT OF INFLAMMATION.

I HAVE said that inflammation is an effect of increased action of the vessels ; in our endeavours, therefore, for the resolution of inflammation, this increased action may be sought to be lessened, first, by absolute weakening ; secondly, by temporary weakening ; thirdly, by soothing means. The first is effected by bleeding, purging, spare diet, &c. ; the second by such means as produce sickness of the stomach, faintness, &c. ; and, thirdly, by sedative and anodyne medicines. The first is the most powerful, but the others may be called in as auxiliaries ; and, where irritation is a cause, the third must accompany the others. But none of these can lessen the original disposition to inflammation ; they can only lessen the effects which it produces, and thereby give time for the disposition to wear itself out.

BLEEDING.

The degree in which this remedy is to be used depends, first, on the violence of the inflammation; secondly, on the power of making blood; thirdly, on situation, nearness to or distance from the source of circulation; fourthly, it being a vital part or not; fifthly, the length of time the inflammation has continued. If the inflammation is from too great action, with real power, the bleeding may be considerable; but if it is too great action with lessened power, or in a weak part, bleeding should be used very cautiously.

Case 1.—A gentleman had a violent inflammation of the eye, the blood was sizy, but, though sizy, the coat was exceedingly tender, and so slight as not to bear its own weight when raised up. He was blooded plentifully, and several times, but without any good. Here was not, then, much power, the blood putting on the sizy appearance in consequence of there being increased action of the vessels in this part of the body.

Case 2.—A lady, with an inflammation of the tonsils, was blooded; the blood was sizy, but loose; and after three bleedings the blood became so loose, that the bark was given, which did service. The disorder returned again, and the same mode was used: the blood was sizy only in the first bleeding; the bark was obliged to be again given. In such cases the bleeding is very seldom necessary. Where bleeding is necessary, it should be as near the part as possible. The pulse is an indication of the propriety or impropriety of bleeding in inflammation; but it is not so certain an indication as to be always to be depended on without the coincidence of other indications; the pulse not being always according to the degree of inflammation, but according to the nature of the part. There may be every symptom of inflammation, and the pulse be soft, and not quicker than usual, and yet the blood, when taken away, will be sizy and cupped.

Case 3.—A lady had this kind of pulse (soft and not quick), and at the same time had a violent cough, with tightness of the chest, and stitches in the side; bleeding was ordered, when the blood was found sizy, &c.; nor did the illness subside until the sixth bleeding. A hard and quick pulse is generally an indication for bleeding, it being frequently accompanied with sizy blood. And with regard to the propriety of bleeding, something more must be taken into the account than the siziness of the blood, as the blood may be sizy, but be loose and lie squat in the bason; in which case bleeding is, of course, less advisable than where its cohesion is firmer. Besides, these appearances in the blood are but after-proofs of the propriety or impropriety of bleeding: we must, therefore, seek for some arguments *à priori;* first, in inflammations of parts not vital, or of parts which do not sympathize much with the stomach, and where there is great power and little irritability, the pulse will be full, quick, and hard; secondly, in inflammations of the same parts, with great irritability and little power, the pulse will be small, quick, and hard; thirdly, when it is in a vital part, the stomach, upper part of the intestines, or parts which the stomach sympathizes with, as testicles, &c., the pulse will

be also small, hard, and quick. The urine will throw some light on the disease: if high coloured, and not in great quantity, bleeding may be very serviceable; but if in great quantity, and very pale, the contrary.

Bleeding is a remedy of so much consequence, that it should be employed very cautiously. Where there is an increased disposition to act without much power to act with, then a disease much worse than pure inflammation takes place, and in which neither resolution nor suppuration is produced, but a state of indolence between the two.

Medicines which have the power of producing sickness lessen the power of life universally; and when they are intended to produce this effect, I think they should not be given in doses large enough to produce any thing more than mere sickness; as the action of vomiting has, I believe, rather the effect of rousing, as few are so weak but they can bear the action of vomiting.

Purges have been much recommended, on the idea that humours existed which ought to be carried off: whether this is the case or not, I only know, that keeping the bowels moderately open has a soothing effect on the system; but it must be remembered, that nothing debilitates so much as purging: *one purging stool may kill.*

RESOLUTION BY EXTERNAL APPLICATION.

Whether we have any applications which can lessen the inflammatory disposition I do not know. There may be applications which may lessen the effects of the inflammatory disposition, and so protract the inflammation until the disposition is worn out. Cold is very powerful in lessening these effects, but is productive of indolence. Lead lessens the powers; therefore is not to be used in the irritable habit, or in a weak state of parts. These applications must act in one of four ways; first, carrying off heat by evaporation; secondly, by repulsion; thirdly, by derivation or revulsion; fourthly, by sympathy, which is, perhaps, nearly allied to derivation and revulsion. These may remove the inflammation by, first, a simple method of cure; or, secondly, producing an opposite state. On this last idea the first mode of action is destroyed, and another mode introduced; but this, I believe, more generally takes place in specific diseases; as in curing a venereal node, by exciting a simple inflammatory action by the application of a blister immediately over the part, or by inducing the peculiar action of mercury, in consequence of which the inflammation, the act of the constitution, is removed. I can conceive all this to take place, and the constitutional action cured without any repulsion, and that the ill effects may be the result of the secondary inflammation not producing such effects as nature intended by the first inflammation. The idea of repulsion has done much mischief: thus, those who have indulged the idea have hardly dared to cure a gonorrhœa, for fear of driving it back into the constitution, which did not originally arise from the constitution, and which the constitution has nothing to do with.

Revulsion and derivation seem to me to depend on the same principle in the animal economy with sympathy, and, with the latter, are most likely to take place in habits the

most irritable ; *i. e.* such as are called nervous. By these terms is meant, the cessation of action in one part in consequence of action taking place in another part. How far disease may be invited to a part, I know not. In almost all cases where revulsion or derivation takes place, the original inflammation is cured, or at least suspended ; but in cases where parts are only sympathetically affected, the original disease often remains unaltered, although the unpleasant or painful sensations arising from it, being referred to another part, would lead you to suppose the contrary.

THE TREATMENT OF THE ADHESIVE INFLAMMATION WHEN THE SUPPURATIVE MUST TAKE PLACE.

If the powers are great, and considerable effects produced on the constitution, bleeding, both general and local, may be used ; but if a contrary state of the powers, in an irritable habit, bark, &c. must be employed. In cases of considerable sympathy of the constitution, sudorifics are very proper, as Dover's powder, &c. ; for one effect of these seems to be, that of producing harmony between the skin and stomach ; nay, through the whole system.

Fomentations, steam, washes, and poultices, are the common applications. The first two are either simple, as from mere water, or they may be medicated. Steam is more efficacious than fomentation ; but the effects of each are very short, going off between the times of application. Washes are of various kinds ; but I am afraid we are not possessed of very clear notions respecting the effect of these washes ; for we have to cure inflammations of the eye by astringent washes ; for the throat we prescribe stimulating washes ; for the urethra, sedative washes, &c. How can applications so very different cure these inflammations, which are the same everywhere ? the effects of these are likewise of short duration. Poultices may be also simple or medicated ; their effects, like the others, may extend beyond the surface of contact, which must be by sympathy. A common poultice is, perhaps, the best application when we have nothing particular in view.

SUPPURATIVE INFLAMMATION.

When the inflammation has got beyond resolution, and exceeds the adhesive, then suppuration begins. A similar process takes place for suppuration, and attended with nearly the same circumstances, let the irritation, which is the immediate cause of suppuration, proceed from what cause soever, external or internal. Irritation, even when very great, is not always sufficient to produce this effect. Violence is one great cause of suppuration ; but violence simply, though considerable, will not always produce it : there must be a prevention of nature's repairing the injury by the more simple means of adhesive inflammation, or by the first intention. The application of air to parts to

which it is not generally applied, has been supposed the cause of suppuration, but such an effect is not the necessary consequence; for there is not a doubt but the irritation producing suppuration would take place even in a vacuum. In emphysema, where air is diffused over the whole body, no such effect is the consequence. In the cells and canals which are in various parts of birds, and which communicate with their lungs, no such effect is produced; and if suppuration takes place in them, from the stimulus of imperfection, usual effects only follow: thus, in a wound in the abdomen, nature endeavours, and often does heal it by the first intention; but if this does not succeed, then suppuration takes place, yet this is not from the application of the air. Air is not, therefore, the cause of suppuration. Suppuration may take place in the investing membranes of circumscribed cavities without a breach of solids, or dissolution of parts, as in the thorax; a circumstance not commonly allowed. We are at a loss, with respect to spontaneous inflammation, to determine whether it is really a disease, *i. e.* a really morbid process, by which the constitution will be injured; or whether it is a salutary process in which nature is endeavouring to relieve herself.

Swellings or thickening of parts happen without common symptoms of inflammation being present, viz. pain, change of colour, &c. There are collections of matter, also, somewhat similar to suppuration, which do not arise in consequence of common inflammation: these I conceive to be of a scrofulous nature. Nor is it always the consequence of a very high degree of inflammation, as may be observed in the gout, in which we may often see inflammation go much beyond that degree where suppuration might be expected, although suppuration may be produced often without visible action in the parts: but it sometimes happens that although the inflammation and consequent suppuration from injury are very considerable, yet we often find that that which occurs spontaneously exceeds it in violence. In inflammations of the breasts of women, and of the testicles of men, the quicker the inflammation proceeds, the more agreeable; and that because, where they are slow, they give suspicion of some specific inflammation, as they generally proceed slower than simple inflammation. Suppuration, as has been before observed, takes place more readily in canals, &c. than in circumscribed cavities, the same cause exciting in one adhesion, and in the other suppuration: thus, if a bougie is introduced into the urethra, suppuration is produced; if in the abdomen, or tunica vaginalis testis, adhesive inflammation is produced. The symptoms which suppurative has in common with the adhesive are in much greater degree, and, besides these, it has some peculiar to itself; thus throbbing, which is produced by the dilatation of the arteries in the part: this throbbing pain seems to be the most distinguishing symptom in the early part of suppuration, with the scarlet colour, proceeding from the dilatation of the old vessels, with the admission of red globules into vessels not naturally containing them, and the formation of new vessels. Swelling increases, and an œdematous appearance, similar to that accompanying erysipelas, takes place. Then one, two, three, or more of the parts affected lose the power of resolution, and take on a disposition to form matter, changing their mode of action; but as this does not take place all at once, some parts may, for some time, continue to discharge coagulable

lymph, as in the adhesive state ; whilst those parts which have taken on the suppurative action pour out matter, the whole of the part not being arrived at the suppurative state, or state for forming matter ; and hence if the tumour is now opened, it will be found to contain both matter and coagulable lymph ; in which state it has been always supposed that the matter had not arrived to a state of ripeness by those who had imagined its purulence to depend upon its confinement and stay. It would appear that suppuration may take place from this peculiar action of the vessels, without breach of continuity. There is a certain period at which suppuration takes place, and this is shewn by a shivering, though the change is in general pretty quick ; yet time must be had for the vessels to be formed so as to be fitted for the suppurative state. This inflammation seems to produce a disposition in the vessels to form matter. That the suppurative is very different from the adhesive inflammation is plain from this, that if a wound in a suppurative state yielding good matter, has, by irritation of any kind, the adhesive inflammation induced to any degree, the discharge lessens, and the wound puts on appearances very different to what it had before. It is a fixed law in the animal economy, that when the effects of adhesive inflammation are fully established, the parts cannot return into their natural or healthy state in a retrograde way, as it were ; but if they are to be removed, it must be by proceeding to suppuration.

METHOD OF CURE BY PRODUCING ACTION IN OTHER PARTS.

Thus I have seen a bubo cured by a vomit : similar effects are producible on scrofulous tumours. Suppuration having been considered as a deposit of matter from the constitution, which ought to be got rid of, warm suppurative applications have been recommended to hasten it ; but as we find that suppuration of vital parts often kills, we should be cautious as to admitting this as a general principle. I doubt whether these are productive of the supposed effects of increasing the formation of the matter : this I know, that if applied to a surface secreting matter, many of them, so far from increasing, would stop the formation of it. Where the adhesive inflammation has gone before, they can be of no service ; but, in case of indolence in a part, they will produce good effects. Poultices can have no effect on suppuration otherwise than by making the skin easier under the inflammation ; and were it not for soothing the part, and lessening the pain which the patient feels, I should not propose even these to be applied, as I conceive inflammation necessary to the suppuration.

SUPPURATION WITHOUT INFLAMMATION

Takes place in most instances, as in many indolent tumours, slow swellings in joints, as white swellings ; in the joint of the thigh called hip cases, lumbar abscesses, tubercles in the lungs, encysted tumours, lymphatic swellings, scrophulous swellings, and those on

the hand and feet: these form matter without inflammation; they come on insensibly, the swelling being the first symptom, and that produced by the formed matter. The matter produced in all these cases is similar, but different from that formed where inflammation has preceded, being curdly, the curd, perhaps, being produced by the coagulable lymph deprived of its serum, whilst the thinner is real matter,—a difference between coagulated lymph of long standing, and that which is lately coagulated: hence it follows that these cases are different both in their immediate and remote causes, as well as in their effects from those where inflammation had preceded the suppuration. The processes in both cases are, in this respect, similar; removal of the matter is the first step, then granulation, and, lastly, exsiccation comes on. The matter may be removed by absorption, or by being let out; the former is common in scrofula: it may get out in consequence of such alteration being made by ulcerative action, as allows its escape. Ulceration after suppuration is often very rapid, and especially if the other was so; but in the kind we have just spoken of it is very slow.

When an opening takes place in the first kind of suppuration, it proceeds directly to a cure; inflammation lessens, and suppuration becomes perfect, these effects taking place where inflammation was the cause; but in the other kind a very different process takes place, for, as in the former, the inflammation which had possession of the part went off, so here inflammation now comes on, and spreads over the whole ulcerative surface (though there was none before), and will in some cases, depending on size, situation, &c., affect the whole constitution. These will, it must be acknowledged, sometimes inflame before they ulcerate; but this is an effect, not a cause, of suppuration, and is produced by the matter distending and irritating the skin. It is extraordinary that often, upon opening these latter swellings, inflammation, fever, nay death, shall follow; but, if suffered to break of themselves, no such effect is produced.

PUS.

The immediate effect of the suppurative action is the formation of a fluid called pus, which is very different from the fluid formed in the adhesive inflammation. The discharge, at the beginning, is very little different from coagulable lymph, and that which is thrown out in the adhesive inflammation; but it is every minute removing from the nature of the blood, and acquiring a white viscid creamy appearance in the cavity. Suppuration on the internal surface of canals does not go through all these steps, and the discharge from these has been called mucus; but it has the globular particles, and every other property which matter has that I am acquainted with. Pus is formed from the blood by some particular action of the vessels, which they take on during their passing out of the adhesive into the suppurative inflammation. It is very different from a straining from the blood of parts unchanged; it is produced by a decomposition and new combination, and by either new vessels, or a new disposition, and a new mode of action: whichever of these it may be, I call it glandular, and the pus a secretion.

GENERAL OPINIONS RESPECTING PUS.

It has been supposed, and is so even now by many, that pus is formed by a dissolution of the living solid, and that it has a power of dissolving the living solid: if so, no part could heal; it would be constantly dissolving by a menstruum which the part itself yielded. From the above idea, we may hear it proposed to give time to the pus to melt down the indurated parts, that the matter should not be let out; but as the parts will be constantly exposed to the action of matter afterwards, there will be as much chance, on their own idea, after opening as before. From the same idea they are led to conclude, that there cannot exist a discharge from a canal without an ulcer. The moderns have been still more ridiculous; they have put dead animal matter into pus, and have thought it has been formed into pus, and have thence inferred opinions similar with the former. In this case they have been putting dead and living animal matter on the same footing; but what is still further, that extraneous matter cannot be formed into pus, they might have seen in wounds, and in suppuration with extravasation, the blood and pus separately in the same cavity; in extravasation, too, of blood in sound parts, they might see that no pus would be produced. In abscesses from violence, and erysipelas, they might see sloughs of dead cellular membrane, hanging like wet tow, which did not melt down into pus, although they had been exposed to the action of the matter for a long time: the same observation holds good with regard to dead bones, when thus exposed to the action of pus; besides if, in consequence of the decomposition of these parts, some of their parts are mixed with the pus, it is altered in some of its properties thereby, the pus attaining a very ill smell. But if there is loss of substance, in a dead piece of bone for instance, it is produced by absorption; in proof of which, we see that the loss is on that side where it unites to the sound parts, and where alone the absorbents can act. The chemists made no difficulty of explaining the formation of pus, and this, they supposed, was done by fermentation; but that neither the melting down of the solids, nor fermentation, is the cause of the formation of pus, is evident from matter formed in canals and internal cavities, without any previous fermentation or loss of substance. On this theory of fermentation the chemist would have some difficulty in saying how it commenced, and how, when once began, it ceased. We may safely, then, discard these notions, and say, that pus is produced from the fluids alone, by the action of the living solids. Pus is discovered, by the microscope, to be composed of globular particles, swimming in serum, or in a fluid similar to serum: the proportion which the globules bear to the serum is dependent on the health of the constitution, strength or weakness of the part, &c. Matter or pus has a sweetish mawkish taste, very different from any thing else; and this is the same, whether in consequence of ulceration or not, *i. e.* whether from an irritated natural surface, as the membrane of the nose, and other outlets and canals, or from an ulcerated surface.

These discharges from canals or outlets have been termed mucus, and not pus; and the surfaces yielding these discharges have been called mucous membranes. A test has

also been recommended for the distinguishing these, when their appearances have been so exactly similar as to afford no visible difference, and when, as I observe, they are one and the same fluid. This test was from the solution of these fluids in different menstrua, and the various appearances exhibited upon their precipitation by different precipitants. This idea was by me treated, at first, as absurd, for I concluded that no difference could possibly take place ; but as it was so strongly asserted and supported by experiments said to have been made, I, to satisfy myself, made several experiments with animal matter, both solid and fluid : these I dissolved in the different acids, vitriolic, muriatic, &c., and made precipitates with alkalies, both fixed and volatile ; but all these precipitates appeared the same, even when examined with the microscope, exhibiting, universally, a flaky appearance.

The quantity of matter depends upon the nature of the part which yields it : with whatever specific quality the part is affected, that same specific quality will the pus possess ; hence we have variolous, cancerous, venereal sores, &c. ; but although it takes on these qualities when the part yielding it is so affected, yet it does not derive these qualities from the constitution, if it is so affected, unless that part is also affected. A circumstance which serves to shew that the part which yields it is of the same nature with the matter produced, is, that it does not prove an irritator to the surface yielding it, though it may prove so to any other surface not similar to it ; hence, from their not affecting that surface, no suppurating surface can be kept up by its own matter. The gonorrhœa, small-pox, &c., curing themselves, is a proof of this ; and were not this the case, we should have constant pain from their irritation, and much greater difficulties in their cure, &c. We do, indeed, sometimes find, that pus will irritate its own surface ; but this may be the effect of some extraneous matter, as blood, &c. in the pus : the intestines will sometimes produce a discharge, which stimulates them very considerably ; but this may be secreted by the diseased surface, and prove an irritator to the sound part of the canal only. What I have hitherto said refers to natural pus only ; but when a specific nature is added, the secretion is then altered. The first alteration is a greater quantity of serum and salts, producing a discharge called sanies : the discharge has sometimes appeared to affect the solids, and has been thence called corrosive, a property which it does not possess, the parts only receding from its irritation ; and where this is the case, perhaps the decomposition and new combination necessary to the formation of the matter is not perfect. By what particular organization matter is produced, we can no more determine than we can the nature of any other glandular organization.

PUTREFACTIVE QUALITY OF PUS.

From several circumstances it would appear, that pus has a greater tendency to putrefaction than other animal fluids ; but this I do not think takes place in the degree that has been supposed. It is brought into a putrescent state by circumstances totally independent of the pus itself ; thus, air getting access to it by a small aperture, while

it is contained in a cavity, or its being near to the fæces; or the inflammation being of an erysipelatous nature, with, perhaps, some degree of mortification; or from the presence of extraneous substances in the pus, as extravasated blood, &c.; for if a sore, in the habit of secreting good and sweet pus should, by accident, be made to bleed, the pus will be more disposed to become putrid; and, in most cases of specific disease, the pus is not so sweet, and that from blood being frequently mixed with it. Where there is a diseased bone the smell of the pus will also be more offensive. True pus may be retained in a cavity, so that the air does not reach it, for a long time, without producing any injurious effects, or acquiring a bad smell.

ABSORPTION

Of whole useless parts is not to be called disease, such as that of the thymus gland, &c. Absorption, in consequence of disease, is of two kinds; first, the interstitial, where absorption lessens or removes parts, without a breach of continuity, by absorption through their whole substance; secondly, progressive, by which is meant that process by which extraneous substances, abscesses, aneurisms, and tumours arrive at the surface of the body, in consequence of the gradual and progressive disappearance or absorption of the parts which cover them. It is this which removes useless parts, such as the alveolar processes, the fangs of shedding teeth, &c. It has effects, in many instances, similar to mortification. It begins at one side of a part, and continues absorbing until the whole is removed, as is the case from pressure, and in the natural opening of an abscess. It will often appear to be doing mischief, as by this process a sore is formed, but this may be from necessity, the parts removed, perhaps, not being capable of being supported; it may therefore take place instead of mortification.

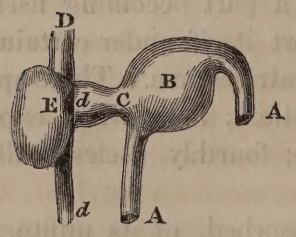
Causes of Absorption.—The most simple cause is from a part becoming useless; another is a weakness or want of power in the part to support itself under certain circumstances, as the gums in salivations, callosity of bones, cicatrices, &c. There appear to be five different situations of parts productive of absorption; first, when exposed to pressure; secondly, to irritation; thirdly, when weakened; fourthly, useless; fifthly, dead.

Other causes are, a consciousness, in the part to be absorbed, of its unfitness to remain under such circumstances, the irritation not being compatible with its existence; it therefore easily accepts of removal: secondly, a consciousness in the absorbents of the necessity of their action on the part. When the part to be absorbed is dead, then the disposition must be entirely in the absorbent. Pressure may be from without or from within: when the first is the case, the first process which nature goes through is that of thickening the part to defend it against the pressure; but if this does not prove sufficient, then absorption of the part takes place: pressure from within increases the absorption also.

INTERSTITIAL ABSORPTION

Is of two kinds: first, where it takes place only in parts become useless, as in the wasting of a limb from disease of joint, broken tendon, &c.; secondly, where parts are subjected to pressure either from without or within, but to such a degree as not to produce thickening or ulceration. Bones are subject to the same effects from pressure as soft parts. Besides what we have hitherto considered, there is another process, the relaxing, elongating, or weakening process. This evidently takes place in common abscesses, where we may perceive that the skin is much more elongated and stretched than it could have been from mere mechanical distention. In women the relaxation of the parts is very considerable before the birth of a child; and the old women in the country know when a hen is going to lay by the relaxation and softness of those parts.

Case.—A lady, after inflammation of some of the abdominal viscera, had the belly swell; some time after a kind of pointing was observed on several parts of the belly; and, upon opening the largest, a very considerable quantity of fluid (matter I think) was discharged; this opening was near the sternum, and the ends of the recti muscles were quite ragged: the patient died. Here was an instance of the effects of absorption, by which an exit was obtained for the matter. Suppose an abscess to go on for a long time with a smooth surface, yet if any part takes on the absorbing process the matter will be very rapid in arriving at the skin, although this process may have taken place in the thickest part. This process may be induced by an irritation in any part of the surface: thus, after the opening of an abscess, if matter is permitted to collect at the most depending part, it may bring on this process, whence a fresh opening will be made.



This is the front of a chest, which contained an aneurism of the aorta; and here, on the right side, you see an instance of the elongating process, the cartilages being bent outwards, or elongated, to adapt themselves to its figure.

This is another preparation: an aneurism of the aorta: A A ends of the aorta; B the first sac, which contracted at C, and having proceeded to *d*, where it met with resistance from the sternum D, it became again contracted; but having produced absorption of the sternum D E, by which an opening is made externally, the sac is again expanded. Here are two other preparations, exhibiting similar appearances.

ULCERATION.

Before I enter upon this subject, I shall make a few more general observations on absorption.

Some parts are more capable of being absorbed than others, which may take place even under similar circumstances ; thus the cellular membrane is much more capable of being absorbed than muscles, tendons, ligaments, bloodvessels, &c., as may be observed in the opening of large abscesses, when the above parts will be found naked, deprived of their cellular membrane. The skin itself, if affected by pressure from without, is less affected by absorption than is the cellular membrane ; hence we may observe, from the continuance of pressure from without, that the skin will remain whole, although the parts beneath will be wasted by the absorption of the cellular membrane : but under other circumstances the skin passes quicker off by absorption than even the cellular membrane ; this may proceed from the skin acting with so much more vigour, either in opposing any injury, or in taking on any salutary action. Although in abscesses, in tumours, and in cases of extraneous bodies, the parts are all round equally pressed, yet we find that the progressive absorption takes place only on that side nearest the skin, and arrives at the skin only on that side : a very slight degree of pressure from within will produce this effect, so slight as would, from without, have produced only a thickening of parts. Bones are susceptible of a similar process. Absorption may be preceded, accompanied, or followed by suppuration ; or it may not be attended with suppuration : the latter is the case in the interstitial absorption. Thus no suppuration takes place in absorption of callus, or of the alveoli of the teeth ; but in the other cases absorption may precede and produce suppuration where there was none before, as in old sores breaking out anew. To distinguish these from all other cases, I shall call that absorption, ulceration, which is either preceded, accompanied, or succeeded by suppuration. Absorption may be a consequence of pressure under two circumstances ; where the pressure is from diseased parts ; or from extraneous substances : of the first is that from tumours, &c. ; thus in a case of aneurism, where the coats of the artery press against the bones, the rib for instance, its coats begin to be absorbed, and, after they are absorbed, that absorption goes on in the bone ; the adhesive inflammation takes place at the same time round it, and unites the circumferences of the absorbed parts : another instance is where tumours make their way to the skin, without any suppuration taking place. Of this I once saw a very remarkable instance in a soldier in the Dutch service : a tumour had formed between the pia mater and dura mater, which gradually increased to a very considerable size, and had shewn itself externally some time before the man died. Upon examination after death, I discovered that the pia mater was absorbed underneath it ; but the chief absorption had taken place on the side next the skin, for on this side the skull was absorbed, and the absorption had begun in the integuments of the scalp, which it would soon have probably ulcerated, had not the man died before nature had finished her operations, and, in this case, no matter was found either on the brain, skull, or in the integuments ; owing, perhaps, to the pressure being made by a living part. This species of absorption is attended with little or no pain, and its effects are as trifling on the constitution, although it may be an effect of an alteration in the constitution.

Ulceration.—This differs from the foregoing species of absorption, and is either a

consequence of suppuration already begun, and where the matter is the irritating substance; or it may be the consequence of circumstances producing ulceration externally: the nearer to the skin, the sooner this inflammation begins.

ULCERATION FROM PARTICULAR STIMULI.

Death, in a part, acts as a stimulus, which stimulus produces this ulcerative process: how it does produce it, is rather difficult to say, but probably the irritation arises from the parts becoming useless. This process is generally attended by inflammation, and preceded by the adhesive inflammation; and perhaps it is this which attends it: but this is plain and certain, that the adhesive does take the lead of the ulcerative inflammation, and thereby prevents the diffusion of the matter through the cellular membrane.

The pain which attends this process is a kind of soreness, but this pain does not attend all cases of ulceration, as in the cases of scrofula: the pain may be, in some degree, as the quickness of its operation. It is probable that all three may be going on together. This operation seldom if ever affects the constitution, though it is very much affected by the constitution.

What I have hitherto said of inflammation I will endeavour to illustrate, by taking notice of what occurs in an inflammation of the peritoneal coat of an intestine. The first inflammation produced is the adhesive, which occasions an adhesion between the inflamed part of the intestine and the peritoneum lining the cavity, which remains, although the inflammation should stop here; but if it does not stop here, then the suppurative takes place, and an abscess is produced, the matter of which is collected into a regular cavity in these adhesions, and is prevented from diffusion through the cellular membrane, and through the cavity of the abdomen, by the effects on the surrounding parts of the preceding adhesive inflammation, as well as of that which accompanies it. This matter, by its pressure, irritates, and absorption takes place in consequence; but as none of the parts, except those between the matter and the skin, are hardly, if at all, susceptible of this irritation, no parts are absorbed but such as are so situated: hence the abdominal muscles, cellular membrane, fat and skin, are removed, in preference to the coat of the intestine. If the suppuration had at first begun in different points, the parts between are absorbed until it becomes one abscess; and when it reaches the skin we have the ulcerative inflammation. It is in the same manner that nature acts in all abscesses of circumscribed cavities; as in common abscess; inflammation of the lung on its side next the pleura; of the pleura itself; gall-bladder, liver, &c.; also in the case of lumbar abscesses, &c. In the substance of the lungs, we find abscesses sometimes go on in a different manner, and open into the cells, and this because the adhesive inflammation finds it difficult to connect the air-cells together; and that the air-cells do not take on the adhesive inflammation, is evident from many observations. Whilst a part is under the ulcerative inflammation, irritation will increase the absorption on any part

of its surface: thus if a large abscess forms on the thigh, opposite the great trochanter, if an opening is made not immediately opposite the trochanter, we shall find that, from the pressure of the trochanter against the part opposite to it, ulceration will take place there likewise: an effect of the same kind we have in the milk breasts, from the irritation of matter in a depending part of the abscess; which shews how very easily, from the slight pressure of matter, the ulcerative process may be produced. Ulceration is therefore no more than a process by which parts are removed out of the way of pressure. The ulcerative process has no power over the cuticle; it is only from its extreme thinness and the mechanical distention that it breaks. From the thickness of the cuticle on palms of the hand, soles of the feet, fingers, &c., we have such excessive pain in abscesses underneath it, as in whitloes; and as, from this same cause, we have so considerable a separation between the cuticle and the skin, these abscesses should be opened early. Poultices act here by their moisture being absorbed by the cuticle, as by a sponge, the texture of which is thereby so altered as to be more easy of distention. After these have been opened, or have opened of themselves by a small aperture, a prominence is formed by the granulations being forced out by the surrounding pressure, and bound by the tight edge of the opening. To this escharotics have been applied; but there is no necessity for them, as it would disappear when the thickening of the parts, in consequence of inflammation, has gone off. But besides ulceration, the consequence of previous suppuration, which we have been hitherto describing, we have ulceration taking place where no reason can be assigned for it, except, perhaps, weakness be the cause, the parts not being able to support themselves. Newly formed parts are much more susceptible of ulceration than original ones; hence we may observe it take place in fresh-formed callus, cicatrices, &c. (See *Anson's Voyage.*) These parts also slough much sooner, they not having gained the strength and firmness which the other parts have: possibly the sense of this weakness in the part is the irritation producing ulceration. Appearances of ulceration are different in different states, whether ulcerating, at a stand, or healing. The ulceration in the small-pox produces death in the part, hence loss of substance, and pitting.

REPARATION OF PARTS.

We come now to trace the motions of nature, in consequence of alterations in parts (loss of substance) either by external violence, or by critical abscesses; and this action, as well as the foregoing of inflammation, is not to be considered as a diseased action; it is a process by which new animal matter is formed. Suppuration, I have said, would arise in consequence of injury done to the solids; and that it was immaterial whether their surfaces were exposed or not, for that suppuration might take place in either case. Granulation has been generally supposed, I believe, to have been necessarily preceded or accompanied by suppuration: this is not strictly the case. It is, I believe, not always confined to cases of breach of the solids. I believe no internal canal can granulate in consequence of suppuration, except there have been a breach of continuity; and

here I may observe, that when granulation does take place in such a canal, it is not on the proper coat of the canal, but from the surrounding cellular membrane. In abscesses, granulation does not always take place, I believe, before the surfaces are exposed to the air. In abscesses there are two surfaces, one immediately under the skin, the other at the bottom of the abscess. Granulation only takes place at the latter surface, at least but very little progress is made on the other surface ; in fact, the latter continues in the ulcerative process, whilst granulation is going on in the other surface ; and what is very curious, parts which were just now taking on the ulcerative action have now commenced action necessary to granulation. In proof of exposure being necessary in abscesses to the formation of granulation, we may observe, that abscesses deeply seated, and which have made a small opening, will in general not granulate kindly until they have been fully exposed to the air; and in confirmation of what has been before observed with respect to the difference in the granulation of the two surfaces of an abscess, we may consider that granulation always tends towards the skin, as vegetables grow from the centre to the circumference.

GRANULATION INDEPENDENT OF SUPPURATION.

Granulation is not always confined to a breach of the solids by suppuration ; for parts are capable of making new animal matter internally, in cases where it ought to have been healed by the first intention. What gave me the first idea of this was the following case, and the appearances observed on dissection, as exhibited in this preparation of the parts.

Case.—I was called to a man with a fractured thigh, and made use of the usual means, but without success, for no union of the fractured parts was formed in the usual time; and about the end of four weeks the man died with some other complaint. Upon examination of the parts, I found that the upper end of the bone rode considerably over the under, and, consequently, there was a great cavity in the soft parts, the parietes of which were thickened by the adhesive inflammation, though not so much as if the parts had been better disposed for the adhesive inflammation. There was no extravasated blood, nor matter, nor coagulable lymph, to be found, except a few threads, which probably were the remains of some extravasated blood. Here the parts had lost two chances of being united, the one by the extravasated blood, the other by the coagulable lymph thrown out by the adhesive inflammation ; and nature had here began a third, which was that of forming granulations of new animal matter on the ends of the bones, and the surface of the surrounding cavity, and adhesions, you see, have taken place between the bones and soft parts, by which the bones would have been united by a bony case: hence we find that granulation may take place without the parts being exposed, and without suppuration. This mode of union by granulation is much more extensive, I believe, than has been imagined ; this third bond of union taking place when the parts have missed the first and second, as just mentioned. In the exposure of

cavities of abscesses we have granulations going on hand in hand, and following suppuration. As the suppurative inflammation follows injuries with exposure, it seems that this inflammation is in general necessary to granulation in these cases. Granulation is an accretion of new animal matter, the old vessels being extended, and new ones formed, the vessels passing from one edge of the surface towards the other. Granulations are always of the same nature with the part on which they are formed: if that is diseased, as with any specific disease, so are they also. The granulating surface is convex, and covered with prominent points; the colour is of a deep florid red, but, when unhealthy, is of a livid colour, which, perhaps, may be produced by the circulation through them being exceedingly slow; this change of colour may also be an effect of difference of position.

Case.—A young man had a wound in his leg in a granulating state: I was surprised to see it on some days of a healthy scarlet, and on others quite livid; but the cause of this he explained to me, by shewing, that if he kept in a recumbent posture for a short length of time, its surface was then of a bright scarlet, but if he stood but for a few minutes it would become livid. This must have proceeded from the newly formed vessels not possessing strength enough sufficient to oppose the weight of the column of blood. Granulations have a disposition to unite with one another, which is absolutely necessary to healing; and this is done, I suppose, in this manner:—when two granulations meet, the mouths of the opposing vessels are irritated, which causes them to embrace each other; this junction, perhaps, being aided by the attraction of cohesion. When the granulations are not sound, there is then a smooth surface. I conceive the internal surface of a fistulous ulcer to be of this nature, somewhat similar to the urethra when in the state producing gleet. Ulcers in this state have a chance of healing, from being thrown into an inflamed state. These granulations, I have before observed, have not the same power with original parts, and do not live as long, sometimes, as the original parts; they are, it would appear, formed occasionally with a short period of existence: thus we frequently see a crop of granulations proceed on for a fortnight or month very favourably, and shall at once find them go off, and the old smooth surface reappear, perhaps the very same surface as that crop had sprouted from: so that I cannot help thinking that granulations may be formed with a certain period of existence, or degree of longevity, similar to the different degrees in different species of animals. Many small wounds, perhaps, would do much better without any dressing than with: the blood, coagulating and drying, forms itself into a scab, which falls off, and shews that nature has completed her work under it; the same will happen often when small suppurating sores are suffered to dry. This is a circumstance not attended to, perhaps, so much as it ought: even compound fractures, with a small opening, if suffered to proceed in this manner, will often give but little trouble. In blisters, where the cuticle is not removed, the situation and process are similar to that with a scab. Almost all cutaneous sores do better without dressing, such are pimples; the skin rubbed off, &c.; for often, when applications are made to any of these, a hundred little pimples

will sprout up: when this is the case, make it a general rule to desist from any application.

Case.—A young gentleman had a small pimple on his leg, to which a little ointment was applied, and in a day or two the surrounding parts were covered with similar pimples: these being treated with similar applications, spread, until the whole leg was covered with them. When I was consulted, and asked what was to be done,—"Nothing."—"How is that?"—"Can any thing be easier?" I said. "Do nothing to the leg."—"Then the stocking will stick to it."—"Let no stocking then be worn: put the boy on a pair of trousers." The advice was taken, and the leg dried and healed up directly.

Contraction of the granulations is a sign of cicatrization coming on. This disposition for contraction is, in some degree, as the nature of the part, and the business which nature has to do. Contraction and skinning are perhaps effects of the same cause; but this contraction on bone, as the skull, cannot take place as in looser parts. This contraction continues till the whole is skinned over, and can be forwarded by art, as by bandages, &c. It shews that this disposition to contraction has some resistance to overcome; but this assistance is not to be used in the beginning, but when the granulations are formed, and the contraction begins. Contraction is often very evident, especially in sugar-loaf stumps, where the skin contracts in a ring, so as to appear to squeeze out the granulations; but this is only on the edge of the skin. Whether this contraction of the granulations is the effect of a muscular contraction, as it were, or is produced by interstitial absorption, is not easily determined, but, perhaps, both may be concerned.

Skinning.—The edges of the sore become white, and a disposition to heal is manifested by this, the skin appearing to be a very different substance from the granulation. I do not know whether it is a formation of a new substance, or whether it is a change of the granulations into a different substance; but I believe the former. It generally takes its rise from the edges of the old skin, but this is not always the case, as sores of large surfaces, skin sometimes in their middle, in detached islands, as it were; but this seldom or never, I believe, is the case, unless the part has been a sore before. The granulations may, perhaps, acquire a disposition to skin, by their being in the neighbourhood of skin, but it is plain that they can take on this disposition without that assistance. The newly formed cutis is not so moveable as the old, owing, perhaps, to its being fixed to the granulations, and this most so when on a bone; but it gets looser and looser, from the endeavours to move it, and the want of motion together becomes a stimulus; in consequence of which absorption takes place, and the superfluous connecting substance is absorbed.

Mercury seems to be capable of producing a similar stimulus with that produced by motion in this case, and particularly when joined with camphor; and, when every thing else fails, electricity may be tried. The newly formed skin has no indentations like the old, nor has it the living principle so strong. The cicatrix is at first very red and vas-

cular, but becomes much less so afterwards, and this from some of the vessels becoming perhaps absorbents, and others being absorbed themselves into the system. Cuticle, forming from the cutis, is not so different *in appearance* as cutis is from granulations. Rete mucosum is much later in forming than the cuticle, and sometimes is never formed, as may be observed in blacks, in whom the cicatrices will remain white a long time: one I saw, in a black, had been so from his infancy.

THE EFFECTS WHICH ALL THE PRECEDING HAVE ON THE CONSTITUTION.

I HAVE before divided diseases into local and constitutional, and observed that local, especially inflammation, were productive of secondary effects, which I called sympathetic, and these, I observed, were either immediate or remote; the immediate was treated on when on inflammation, to wit, the sympathetic fever. The remote are now to be considered. The condition which the constitution takes on after inflammation, and which does hurt to the constitution, appears to be productive of those diseases which are called nervous, as spasms, locked jaw, and other signs of great debility, nay, of dissolution itself: these sometimes appear to be the consequences of great suppurations, and are not salutary actions, or effects removing the morbid cause, but harass the constitution without any such consequence.

Hectic is one of these remote constitutional sympathetic effects; it is a condition of the constitution produced by a local disease, which the constitution is conscious it cannot relieve itself of by a cure. When produced by parts vital or not vital, the difference is perhaps only in the time of its coming on, and its duration. Tumours of the stomach and of the intestines, which press also on the mesentery, as well as tumours in the lungs, produce hectic, and this because it is an affection of a vital part, as they might not produce such effects elsewhere: they may also give rise to other symptoms peculiar to the nature of the part, such as cough, jaundice, wasting, &c. Affections of the large joints of the trunk and extremities produce hectic also; but it will not be brought on by similar affections of the lesser joints, as of the fingers or toes. Affections of the joints of the lower extremities produce these effects sooner than those of the upper. Hectic may be said to be a slow dissolution; it is a low fever, with weakness; or, rather, increased action, with weakness. The particular symptoms are, great debility, quick and sharp pulse, sickness, wasting; proneness to profuse sweats; urine at one time appearing perfectly clear, at another depositing a branny brickdust-coloured sediment; and often attended with a purging. This has been laid to the charge of absorption of pus from a sore; but I have for some time suspected that this was not the case, and this from observing that it is produced more by the diseases of some parts than of others; that sometimes, as in white swellings, it began before any pus was formed: I therefore concluded it to be produced by some local complaints, which had particular properties. Now I have before noticed, that the constitution sympathizes most with

vital parts ; I also observed, that vital parts are difficult of cure ; the same I also remarked of ligaments, bones, tendons, &c. I also observed that the constitution was affected by an incurable disease. Now let us see how far the absorption of matter can be the cause of this ; if it was, I cannot see how any patient could be without it who had a sore with a large surface, as we have no reason to suppose that one sore is more capable of absorption than another ; nor have we any proof that more is absorbed in an hectic than in a healthy state of the sore. It may be said to be an effect of irritation and absorption joined ; but if absorption has any thing to do with it, why does it not appear, when even venereal matter is absorbed? When matter is formed on the internal coats of veins, and which must necessarily be washed into the circulating blood? Also why do not such effects appear when the matter of a large abscess is absorbed, which is sometimes done, as in scrofulous abscesses, without any ill symptoms following? Again, how happens it that this symptom does not always continue as long as the suppuration ? I am doubtful whether absorption of matter takes place in one sore more than anoth; and if it even does, I cannot think it does any injury : I therefore conclude, that this disease is produced by the irritation caused by an incurable disease of a vital organ, or of some other part. In abscesses, if the inflammatory and suppurative stage is salutary, the constitution is not at all affected ; but if the contrary, then the constitution is teazed with it ; as is the case also in diseases of large joints. Such an effect also takes place sometimes in the venereal disease, but this not when the matter is absorbed into the system, but when it has existed there a long time, and is then not an effect of that absorption, but of the constitution being harassed by a disease which it cannot cure.

We have, I am afraid, no cure for this disease ; we can only remove it by removing the cause : whilst that continues, we cannot prevent these effects taking place. Strengtheners and antiseptics have both been recommended ; and both these are comprehended in bark and wine : but bark cannot cure this disease ; it can only support the constitution, and render it less susceptible of the irritation of the disease. Wine, I believe, in general, does harm, by increasing the action of the machine without increasing its powers ; but the only cure is to be had from the removal of the cause : the local disease ought therefore to be cured, and, if not curable, if it could be removed it ought, and then these symptoms will go speedily off. I have known a man with a white swelling not sleep for a fortnight, but have a good night immediately after the amputation of the limb. I have known even cold colliquative sweats, and even purging stop, and the water drop a sediment directly after the operation. There is another consequence of inflammation which I call dissolution, because few recover ; it may arise in long continued suppurations, which may not be incurable in themselves, and in this it differs from the hectic. Dissolution is more the effect of the past than the present, which is the reverse of the hectic ; these diseases being by no means the same. Dissolution often attends compound fractures, and sometimes follows operations. It has sometimes the appearance of a continuance of the sympathetic fever, where the constitution cannot go into the suppurative stage. The symptoms of this disease are, nausea, and shiverings at the beginning ; a quick small pulse ; perhaps a bleeding from the whole surface of the

sore; mortification, and signs of death in the countenance; and all these whilst the sore appears to be within the powers of the animal; but undoubtedly the size must assist in producing this effect, as it does not take place where there is no sore. The removal of the part does not effect a cure here, as is the case in the hectic; nor do I know any thing that has been offered for its cure.

BROKEN TENDONS AND SIMPLE FRACTURES.

These are healed by the first intention in general. There is this difference between the cure of simple and of compound fractures; the former being, as just observed, cured by the first intention; the latter requiring granulation to its cure. The treatment of fractured bones and tendons is in many respects similar. Tendons, perhaps, are in general broken during the time of great action and resistance. The tendo Achillis, and that of the plantaris longus, being, perhaps, the only tendons in the body which can be affected in this manner by the action of the muscles, without great external resistance; the same may also be said of the patella. Replacing the parts is the general principle of cure wherever there is a breach of continuity, and the parts should in general be brought as near together as possible; there may, indeed, be a few particular objections to this. This accident happens when the opposition has been made with great velocity, and may be either accompanied by violent exertion or an unguarded motion. In the exertion by the will the shock to the tendon is prevented by every other part doing its duty, and taking on its share of action; thus, in jumping, unless any accident occurs, such as the foot slipping, the spring is made, and the feet again placed on the ground by the regular action of the muscles, which is adapted to the effect intended to be produced. But in the accidental there are none of these provisions: one circumstance often preventing this accident is, the muscle whilst in action being similar to an elastic string, and will therefore, with its tendon, be less likely to be injured by the violence: thus, suppose two strings, one elastic, the other non-elastic; suspend to each of them one-half of the weight they are capable of bearing, and then give to each ofthem velocity equal to the other half of what they could bear; the non-elastic string would then break, the other not. The position of the foot, at the time of violent exertions, is such as is also unfavourable to the production of this accident; but notwithstanding all these natural guards, this tendon is sometimes broken, and that even when dancing, or walking across a room; but when this has been the case, the muscles have generally been tired, and have began to act for themselves, as is the case in cramp. When the tendo Achillis breaks, it is with a snapping noise, and sharp pain, both together giving the idea of a smart blow having been received on the part: the muscle contracts, and is affected by a spasm, in consequence of its contraction beyond its power of returning, and the ends of the tendon are separated from each other. The first thing to be done is to squeeze the calf of the leg downwards with both hands, whereby the cramp is taken off, and the upper end of the tendon is brought lower down: the heel should be raised towards the calf, and may be retained in this posture by proper ban-

dage; the parts surrounding the tendon will swell, from the effusion of the coagulable lymph, which serves by its pressure the office of a splint; and I recommend the patient to be let walk almost from the first, i. e. as soon as the inflammation is gone off. This advice must be attended to, that while the patient is endeavouring to walk, three or four pieces of leather must be put under the heel, inside the shoe, to raise the heel, which may be gradually lessened; the calf to be rolled tight downwards, which, by making the muscle act with more difficulty, the tendon is thereby brought down: the foot to be kept not quite at a right angle with the leg. In walking, the toes must be turned outwards, and the inside of the foot turned forwards, and for some time that foot must be set first, that the ends of the tendon may be brought near to each other; nor can much injury follow from there being about half an inch distance between the divided ends of the tendon; for the worst that can happen will be, the muscle losing half an inch of its contraction, which it would regain after a little time. Besides, if the muscle had a greater power of contraction than the joint of the ancle had motion, then nothing might be lost; but the inconvenience might be greater if it healed shorter than before. The straps and bandages retaining the leg in the proper position need only be put on at bedtime, and may be left off entirely in about three or four months. In his walking, it will be found, from the intelligence held with the mind by the parts injured, that the patient will not be capable of voluntarily acting with this muscle, therefore there is no fear of any voluntary exertion doing harm: all that is to be feared is from a slip. In about two months he will find he has imperceptibly began to use this muscle a little. When I attended the Duke of Queensberry, it was said by some of the first surgeons, that there was no fracture of the tendo Achillis, because he walked about the house almost from the first.

A fracture is a solution of the continuity of a bone. By this, more or less of a cavity is formed between the ends of the bone; the soft parts are sometimes also lacerated, or otherwise injured, by which this cavity is so much the more enlarged. This cavity is then generally filled with blood from the ruptured bloodvessels, which, not being exposed in simple fractures, retains its living principle, and is united with the surrounding parts, as when one living part is engrafted on another. It becomes vascular, either by the formation of new vessels, or by the continuation of old ones from the surrounding parts; the adhesive inflammation also taking place. After it has thus become vascular, it goes through respective changes, until it becomes similar to the part with which it is in contact, becoming first cartilage, and then bone; the cure being performed by the first intention. All that a surgeon can do is, to put the parts in as natural a situation as he can. It has been disputed which was the best position for a patient to lie in when there was a fracture of the lower extremity, whether on the back or side. I suppose on the back to be the best posture, as it is most easy to the patient, and will admit of the necessary motions of the body with more ease. I had a patient who was getting well of a fractured thigh, when he by accident again broke it. He was cured of the first lying on his side; of the last, on his back; and, notwithstanding the previous confinement, he declared the last position was much the easiest.

COMPOUND FRACTURES.

If the laceration is continued through the skin, then some of the extravasated blood escapes, and the remainder may be so much exposed as to lose its living principle; then suppuration becomes necessary for the removal of the blood, which, by its death, has become an extraneous body. To suppuration granulations must succeed; and these granulations must go through their several changes, until they become bone, &c., as was the case with the extravasated blood in the simple fracture. In these cases considerable inflammation and fever proportioned to the local injury come on. There are two cases which I call mixed, partaking of the nature of each of the above; the first is, where the injury was originally only a simple fracture, but has become compound by pressure, abscess, &c.: this I call simple compound. These are much less dangerous than those which are compound from the first, which probably may be in consequence of the extravasated blood, by having lain in contact with the surrounding living parts so much longer, having by so much more retained and acquired the living principle. The cure is here very little different from that of the simple fracture. The second is, when the fracture was really compound at the first, but the external wound so small, and the soft parts having sustained so little injury, as to require very little different attention than what is required in the simple fracture. In both these cases the splints, bandages, &c., should be so placed as to allow the wound to be looked at occasionally, which should be treated as simply, and healed as soon as possible, and by the first intention, if it can: this may be sometimes done, when the wound is very small, which must be covered with a piece of sticking-plaister.

Inflammation, Suppuration, &c., of circumscribed Cavities, as the Abdomen, Thorax, &c.—These may sometimes be formed into true and distinct abscesses by the formation of adhesions inclosing the matter, as in common abscesses. If the inflammation does not stop at the adhesive, then suppuration follows, and ulceration also becomes necessary for the exit of the matter, which is an extraneous substance. A material circumstance happens in the inflammation of cavities containing vital parts, which is, that very little sympathy exists between the surrounding parts and the parts contained; whence the inflammation of the one is not always continued to the other: thus, inflammation of the peritoneal coat of the abdomen and peritoneal coat of the intestine may exist without inflammation of the inner surface of the intestine. But this does not hold good universally, for inflammation of the tunica vaginalis testis spreads through the whole body of the testis.

Inflammation of the Pleura.—This membrane, that which covers the pleura as well as that which covers the lungs, is very susceptible of inflammation: perhaps there is hardly one person in fifty, who, at the age of fifty, is without adhesion of the lungs to the pleura. We often find the lungs adhering to the whole surface of the pleura lining the thorax. Abscesses may be here formed, either having the matter inclosed in a particular bag

formed by the adhesions, or diffused through that whole side, forming one large abscess; hence the true and false empyema.

Empyema.—The chest may be diseased either by a collection of air or by a collection of extravasated blood, matter, serum, &c.: one symptom likely to mislead us, and to make us suppose the disease to be in the heart itself, is the irregularity of the pulse, but which is the consequence of the heart sympathizing with the lungs. The true specific symptom of a fluid extravasated in the chest is, difficulty of breathing, with all its attendants, and this better in some positions than in others. If the water is only on one side, the patient can only lie on that side; if on both sides, he can only lie on his back, and not horizontally, but elevated in both cases. He may feel the fluctuation whenever he moves, and often a weight on the diaphragm; anasarca and ascites often take place. The common symptoms are, difficulty of inspiring, with great lowness and oppression. The sympathizing symptoms are, irregularity of pulse, flutterings, and palpitation. When the existence of the fluid is ascertained, it should be let out, and the wound endeavoured to be healed by the first intention. When this operation has been performed, I have always seen a discharge of pus, which has arisen simply from keeping the external wound open, inflammation and suppuration taking place over the whole surface of the pleura. I am inclined to think, that nothing could have saved these patients but a resolution of this inflammation. Wounds, indeed, have been made into the thorax, which have suppurated and have yet done well; but how this has been brought about I cannot tell: General Murray, to whom I have often expressed a wish to have a peep into his chest, has been twice thus wounded. I made an experiment with a dog, but nature and the dog cheated me; for I made a wound into the chest of the dog, and intended to keep it open until the whole surface and the pleura had taken on suppuration, when I meant to have let nature had its way, and have cured the dog as she pleased; and then I intended to have killed the dog, and seen in what manner this had been done: but the dog would always lie on the wounded side; and when, after death, I examined it, the lungs, I found, had adhered to the wound, and prevented the spreading of the inflammation over the surface of the lungs. The wound, after the evacuation, should therefore be united as expeditiously as possible, to prevent inflammation and suppuration on the whole surface of the pleura, which would take place, and destroy the patient nineteen times out of twenty. The heart and pericardium often go through the adhesive, but seldom the suppurative inflammation, which is generally productive of symptoms not unlike those of the disease called *angina pectoris.*

Emphysema.—In consequence of a fractured rib, the ends of which point internally, the lungs may be wounded; and the air may pass out of the air-vessels into the cavity of the thorax upon inspiration, and thence into the cellular membrane at the time of expiration. Now it must be remembered, that internal wounds do not inflame so readily as external ones; and the wound in the lungs, from its coming in contact with the air, may be considered as an external one, and that of the pleura an internal one: the former will therefore, probably, heal sooner than the latter, whereby the air will be confined in

the cavity. The operation for the relief of this disease is making a perforation into the cavity for the escape of the air. This operation should most religiously be avoided whenever it can, because it will produce inflammation and suppuration over the whole surface of the cavity; but if the opening must be made, it should not be made near the fracture, as that would be making it a compound one. In these cases, the patient ought not to be rolled, as by this confinement the other lung is prevented from acting: it also prevents the air from getting out of the thorax, which should be allowed.

Peritoneal Inflammation.—The peritoneum is more subject to spontaneous inflammation than most membranes, but not so much so as the pleura. The symptoms are, great pain and soreness upon pressure, fever much higher than in an affection of a common part; the disease runs also much quicker through its stages. It has been often taken for a fever, and the pain, &c., looked on only as a symptom. In some cases a diarrhœa comes on, and at others costivenesss; both these, I am inclined to think, may be set down as sympathetic affections. It is difficult to say, at first, whether it is simple inflammation, or erysipelatous: if it is the latter, the pulse will soon sink, although at first it might have been otherwise, from nature having been roused at the first consciousness of disease attacking so important a part. In simple inflammation of the peritoneum, I need say nothing of the importance of early and plentiful bleeding: in the erysipelatous, some consideration must be had; as, on the one hand, this species of inflammation sinks the patient; and, on the other, death must be the consequence of suppuration. If we are confident of its being erysipelatous, how far bleeding lessens erysipelas I do not know. Peritoneal inflammation happens a few days after childbirth, which has been called puerperal fever. The fever is only a smpathetic affection, in consequence of the inflammation of the peritoneum; although this last has been thought to be only a symptom of fever. This inflammation is not the consequence, as might be supposed, of inflammation first affecting the uterus; although it is, in my opinion, a consequence of a particular affection of the uterus. What this particular affection may be, I cannot say, but suppose it to be such as gives to the peritoneum the consciousness of imperfection, and that inflammation arises in consequence thereof. This may be illustrated by the following experiments:—Two cocks' combs were frozen, and nature threw them off as useless to the system, although I did not suppose them really dead, but giving the stimulus of imperfection. Suppose a man wounded in the belly with a sword, and a wound of the intestine also: if the wound is not suffered to heal by the first intention, inflammation may arise, and that not from continued sympathy, but from the want of perfection, from a consciousness of a want in one of the parts. Now this consciousness may arise without the removal of a part. I can conceive that the uterus may be in such a state as may give to the rest of the abdomen a consciousness of its being dead to that cavity; but this, perhaps, is only ideal. Inflammation after tapping produces the same symptoms as in the spontaneous arising after childbirth; and may not that be produced by a consciousness of imperfection in the cavity?

HERNIA.

The consideration of inflammation of internal cavities leads me to make a few remarks on hernia. One would suspect that the operation for the bubonocele might be succeeded by universal inflammation of the peritoneum, in consequence of the opening made into the cavity of the abdomen; but this very seldom happens, and that from the care with which the opening into the abdomen is kept closed: that care which prevents the escape of the intestine serves also to prevent the inflammation; and in assistance to this we have the good effects also of the adhesive inflammation. But we have not the same in the umbilical hernia; for after an operation here, pressure cannot produce its good effects, nor is the opening through which the intestine protrudes of such a kind as will admit of healing by the first intention, being also circular. This is a preparation where nature had done every thing in her power: it is of the umbilicus of one on whom I performed the operation, and who died in a little time after; and here you may see, that the epiploon has, after the operation, adhered all round to the inner edge of the wound.

CÆSAREAN OPERATION.

In this operation, and in every other instance where the lips of the wound do not apply well together, assistance should be had from art to unite them as closely as possible. If it should be found necessary to use sutures, care should be taken that they pass not through into the cavity of the abdomen, as by this they produce effects exactly contrary to what was wished,—that of rendering the cavity perfect; for as these continue, suppuration of the wounds made by them will come on, they acting as a seton, by which the exposure of the cavity will be the greater; though perhaps, from the irritation they would occasion, adhesions would be formed at the bottom of the wound before they suppurated, which might prevent the air from getting in them.

In a woman on whom I performed this operation, and who died, I found (thirty-six hours after) that the intestines had adhered to the inner edge of the wound of the abdomen for an inch in breadth: the uterus was entirely within the pelvis; but the edges of the wound in the uterus had not closed at all, and a good deal of coagulated blood was found in it. I should, therefore, in future, wait until the bleeding had nearly stopped from the uterus before I closed the external wound.

BLADDER.

It may be said, that the bladder being so seldom inflamed after the operation for the stone, is an objection to my supposition that an opening into any circumscribed cavity, by the exposure and by the consciousness of imperfection induced in the cavity, is almost

necessarily productive of inflammation of that cavity; but here it must be observed, that the internal surface of the bladder partakes more of the nature of that of outlets than of circumscribed cavities, admitting, therefore, less of the adhesive inflammation; and that it is more accustomed to and less affected by the action of extraneous matter, which must render it not so susceptible of inflammation from exposure.

CAVITIES OF THE JOINTS.

Wounds of the cavities of the joints often produce very ill effects: great pain, with severe constitutional symptoms. If they do not unite by the first intention, the suppurative process is often imperfect and tedious. In such accidents, the cure by the first intention should be attempted by every means in our power; but sutures should be avoided here, for the reasons stated under "Wounds of the Cavity of the Abdomen," and from their increasing the inflammation by their irritation; bandages, therefore, are preferable.

SACCULI MUCOSI.

There are other cavities, besides those of joints, which are liable to inflammation from irritation; these are the sacculi mucosi, which are, in fact, the joints of tendons with tendons, tendons with bones, tendons with cartilages, &c. They are most frequently affected with an increased secretion of the fluid which naturally lubricates their internal surfaces; but are seldom attacked by suppurative inflammation: when they are, the matter is frequently absorbed, as is also the case with ganglions. A gentleman who had a ganglion removed by a blow, had it return; and it was then absorbed whilst Canada balsam was being applied to it, which acquired the credit of it. To make a radical cure, an opening must be made into them, and the wound prevented from healing by the first intention: the suppuration is not, in these cases, generally very kind.

EYE.

I have seen suppuration take place in the eye three times after extraction of the crystalline lens, the posterior chamber being thereby exposed. This effect seldom takes place but when the crystalline or vitreous humour is much disturbed or lost. Suppuration will sometimes take place in the anterior chamber and not in the posterior. A difficulty of distinguishing the matter, from an opacity of the cornea, may arise; for if the anterior chamber is filled with matter, it will, as well as in the other case, keep from view the parts behind the cornea; but the opacity of the cornea may begin in any part of the cornea, whilst the opacity from matter begins at the bottom, making a segment of a circle, the upper and straight line of which will gradually rise higher and higher, until

the whole cavity is filled. If it is an opacity of the cornea, absorption of the part occasioning the opacity is the only cure ; if it is pus collected, the cure will consist either in the absorption of the pus, or in its evacuation : this last effect may be produced by ulceration taking place on the external surface of the cornea, as in other abscesses, which may be known to be taking place by its pointing ; but when we consider the ravages this makes in the coats of the eye, and the total obliteration of the eye afterwards, it is desirable that this should be avoided, and the letting out of the matter appears preferable. It should be done by an incision similar to that for extraction, and as soon as it is discovered that the absorbents will not take it up ; but this will not invariably succeed, from the wound not always healing by the first intention.

THE BRAIN.

I HAVE not seen enough to determine what degree of inflammation the brain takes on when the pia mater is opened ; but from the protrusion of the brain in such cases, inflammation may be inferred, as I observed in the protrusions in whitlows. With respect to the dura mater, I have been very unlucky, never having seen a patient recover who had a wound of the dura mater.

VEINS

ARE subject to inflammation in the same manner as the other circumscribed cavities, and by no means similar to the outlets ; and hence we may infer, that the blood is not merely a passive substance, but is in a state of harmony with its vessels. I have seldom examined any part after death, which has been violently inflamed, but I have found the larger veins passing through the part inflamed also. But the case in which this is most observable is, after bleeding, producing effects which have been imputed to a wounded tendon or nerve, or to something in the constitution : but the real cause of these effects is the opening made by the lancet not healing by the first intention, which will produce inflammation in all its stages ; an abscess may be formed between the skin and the vein, or within the vein itself; adhesions being formed by which the matter is prevented from being carried to the heart ; or it sometimes goes no further than the adhesive stage, the sides of the veins adhering together ; in which case the vein is obliterated : and here I will mention an observation I have made, which is, that after I have bled a person in a vein which was rather small, and it has been required to repeat the operation soon after, within a day or so, I have not been able to obtain so great a quantity of blood as at the first, and that, I suppose, from some degree of adhesive inflammation contracting the canal. I therefore, until the inflammation is supposed to have gone off, would prefer another vein. Sometimes a very long abscess will be formed, and sometimes a series of them, between the orifice and the heart ; and it will occasionally happen between the extremity and the orifice. I have seen inflammation from the vena saphena

up to the groin, abscesses forming all the way. This is a preparation in which you may see the vein obliterated in many places by the adhesive inflammation ; and in others, the suppurative has gone on forming abscesses, particularly a large one had formed in the axilla, which had obtained a free passage into the circulation, and which probably killed him (the patient). I have always found, that when large abscesses have come on, the veins have been obliterated. This inflammation of the veins is very common after bleeding horses, of which many horses die. Whether death takes place in these cases from the inflammation extending to the heart, or from the mixing of a large quantity of coagulable lymph or pus with the blood, I have not been able to determine. To prevent these ill effects, we must, when the bleeding is finished, bring the lips of the wound exactly together by pushing the skin with the thumb and drawing it with the compress, which should be sufficiently broad and thick. I have seen it several times where the orifice has opened a second time and bled again, and has not been properly closed. A plain compress is preferable to the application of sticking-plaister, the coagulated blood being the best application ; as is also the case in slight wounds with a fracture. If inflammation has just come on, but not arrived to suppuration, a compress should be applied, to produce adhesion of the sides of the vein, whereby the inflammation may be prevented from reaching the suppurative stage. If the suppurative is already come on, then let pressure be applied immediately above, to prevent the passage of the matter to the heart, by producing adhesion there. With respect to the arteries, I cannot say any thing to the inflammation in them ; but I suppose suppuration in them may be one cause of mortification.

HYDROCELE.

The true encysted hydrocele consists in an undue secretion of the fluid which moistens the cavity of the tunica vaginalis testis. This, like all other circumscribed serous cavities, admits of increased serous exhalation, adhesive, and sometimes suppurative inflammation. The scrotum is subject to collections of fluids similar to other parts. When increased serous exhalation takes place in the cellular membrane of the scrotum it extends to the cellular membrane of the penis, and produces phymosis, with a twisting of the penis. The radical cure of this must consist in an alteration in the state of the constitution : but the disease will not allow us to wait for this ; we must evacuate the fluid, and this is best done by punctures at the bottom of the scrotum ; and sometimes it is necessary to be done also in the prepuce. Before these punctures are made, attention should be had to the state of the patient, as, when the vital powers are weak, the punctures are apt to take on mortification. In such a state, therefore, they, if made at all, should be made very small. Another collection we are told takes place in the cellular membrane of the tunica vaginalis of the chord. An hydatid may form anywhere on the outer part of the testicle, or in the body of the testicle (of these I have seen several), and may be joined with the true hydrocele, as in this preparation, where an hydrocele formed on the tunica vaginalis testis, which was also distended with water ; and hence two distinct cavities of water, one behind the other. Another case

I saw, where a gentleman intending to perform the radical cure for the hydrocele had made a large incision, when, after the water had run off, finding a large softish tumour, which he concluded to be a diseased testicle, he removed it, and upon examination, it appeared that the testicle was sound, forming the posterior part of the tumour, an hydatid having formed on its fore part.

The true encysted hydrocele is common to all ages: in children it will happen from the communication with the abdomen not being yet shut up. This has a good deal the appearance of a rupture. In these I never do any thing, as the fluid is generally absorbed. Hydrocele is not peculiar to the hydropical, and depends, therefore, not on the constitution, but on the part; and is therefore truly a local disease. It is common to all climates; but seems, I think, rather more prevalent in the East Indies. I have tried the external use of mercury, and diluted spirits of turpentine, without producing absorption; but the latter has, I think, sometimes stopped the disorder from increasing so fast. It must be carefully distinguished from diseased testicle, and from a rupture with fluid in its sac. Its particular situation should also be ascertained. Fluctuation will sometimes help, but in other cases it will not. Mark the difference well between this disease and a diseased pulpy testicle: its particular form will often assist, but not always. If transparent enough to permit the light of a candle held behind it to shine through, it will have been evident enough by every other mark to need no such experiment. It must be determined, whether it is an hydatid or the true hydrocele of the tunica vaginalis testis. In general, the testicle is in the posterior part of the hydrocele, except it should, by any particular adhesions, be joined to the fore part; but if it is an exterior hydatid, it is difficult to say where the testicle may be situated.

I once performed the operation for the radical cure, and cut upon the cicatrix of the wound I had made some time before for the temporary cure; and was surprised to find that no water came. I had cut into the testicle, which adhered there; and upon making the incision lower, the water came away, and the patient did well. I would always advise, that where this circumstance occurs, never to make the incision, for fear of wounding the spermatic artery and castrating the patient. I once saw a gentleman perform the operation for radical cure on the cicatrix; no water came; he then made a wound higher, and wounded the artery, which bled very much: it was taken up, and I advised him to make another either lower or on a side, which being done, the water came away. When by any accident the cellular membrane gets filled with blood, it gives very much the appearance of a mortification.

Temporary Cure.—Of this I shall not say much, as the operation is hardly so nice as bleeding, except endeavouring to ascertain the situation of the testicle; and here I must observe, that wounds of the testicle are by no means so dangerous, I believe, as has been imagined; for in one case, where the testicle had adhered to the fore part, four wounds were made without any discharge of water, and which afterwards were discovered to have been in the body of the testicle. Neither in this nor in the case above related, where I wounded the testicle, was there any particular pain at the instant, or any particularly ill consequences. The pain produced by pressure on the testicle is of a particular kind, producing faintness and sickness; but no such sensation is produced by the pres-

sure of a hydrocele ; and hence another source of distinction. The palliative, or temporary cure, requires an incision with a lancet or trocar, not bigger than what is necessary in bleeding. It would be advisable that this operation should be performed at such times as will allow the patient to lie by, if necessary ; as sometimes inflammation may come on and produce a radical cure, where the temporary one was only intended. Blood may be extravasated in the cellular membrane or sac, the former appearing like a mortification ; but this will be generally absorbed in the latter, and will even sometimes be of good effect, producing an abolition of the cavity by its healing by the first intention.

The radical cure is recommended, by different surgeons, to be performed either by evacuating the fluid by a large incision, or by introducing into the sac, a tent, or a seton ; others advise the removal of a portion of the sac. All these means are intended to effect one object—the obliteration of the sac ; but all in their turn have failed. Now, it is not my intention here to recommend one mode in preference to another ; but to endeavour to shew, that the failure of them all depends on the same principle. There are but two natural methods by which this obliteration may be produced, and these comprise our two species of inflammation, the adhesive and suppurative. Healing by the first intention, it must be remembered, is always performed through the medium of the extravasated blood ; but the union of the sides of this sac may, like those of other sacs, be produced by the adhesive inflammation, though it very seldom does take place, as we have no certain mode of obtaining and supporting it, without producing the suppurative ; although I acknowledge the possibility of it ; for I have seen this sac obliterated in dead bodies. But here, perhaps, there had never been any water collected : this might have been an effect of the adhesive inflammation in cases of hernia humoralis ; but if we could regulate the adhesive inflammation to our wish, we should find, from the existence of a little water in the sac, and from the size of the sac causing it to collapse irregularly, that the obliteration would be very seldom complete. I once saw a cure produced in this way, after tapping for the temporary cure, the wound healing almost directly after a slight inflammation had come over that testicle, no discharge of pus taking place. It has been lately supposed, that in the radical cure the tunica vaginalis entirely sloughs off, by which the obliteration takes place. A small part of the membrane may do so ; but there is a circumstance which occurs, and generally where the caustic has been used, in which there is a discharge of a substance appearing similar to the slough of such a membrane, and is produced by a quantity of coagulable lymph thrown off into the fluid, and assuming this appearance by being coagulated. It has sometimes happened, that the suppurative process may go on within the sac during the existence of hydrocele, the matter mixing with the extravasated serum, an abscess being here joined with the hydrocele : sometimes these will point outwardly.

Case.—I was called in to assist at an operation, the removal of a diseased testicle. I found a large wound, and at the bottom of it saw the testicle very much enlarged. I was told, that upon making the incision, there was a discharge of matter mixed with the serum. From the first appearance, I thought that the inflammation was healthy, and

concluded that the enlargement of the testicle was the effect of the inflammation only, especially as the patient had had no pain before this inflammation came on. The testicle was left, and the man was cured.

The removal of a part of the sac—nay, the whole of it—has been recommended; but this cannot be at all necessary. Nor will the removal of a part of the sac always produce a cure, as will be shewn in a case hereafter. Incision, it has been said, is to be preferred, because it gives an opportunity to examine into the state of the testicle, which may be found diseased; but from the preceding symptoms, and from examination by feel, immediately after the evacuation of the fluid, we may, except where the caustic has been applied, always discover the state of the testicle. Indeed, if the case is doubtful, an incision may be made. The reason of the frequent failure of this operation, is to be found in a principle and fixed law of the animal economy, namely, that if two or more parts of a sac are brought into contact, and an adhesion is formed in any part of that sac, no adhesion will be then formed beyond that first adhesion; as if nature did not seem to find it necessary to form any more adhesions beyond that part, the cavity being so far complete: the adhesion even will take place only on that edge nearest the exposure. In consequence of this, after the evacuation of the fluid, and the speedy falling together of the membrane, partial adhesions only take place, leaving one or more cavities in which water may be collected. Before I discovered this, I could not account for the failures; but this was made evident in a man who died of the small-pox whilst under the radical cure. Failures from this cause occur with the tent, seton, and caustic. The edges of the wound from caustic have come in contact with the tunica albuginea, and adhered; the cavity being thereby completed, and the wound excluded from it. This I have likewise seen take place, excluding the tent; nay, the same I have seen happen with the two wounds of the seton, the seton only preserving a tubular cavity, without the sac, nature having in all these cases obtained her point of preserving the cavity. This is most likely to happen where the water is fully evacuated before the suppurative inflammation comes on; the sac collapsing, the wounds come in contact with the tunica albuginea of the testicle, and adhesion may take place in that part. To prevent this, where a tent or a seton is used, I recommend them to be full as large as the wound, that the water may not be permitted to run off and the sides come in contact until the suppurative inflammation is come on; and when the caustic is used, I do not immediately let the water out as soon as the action of the caustic has ceased, but let it remain until the suppuration comes on, which is when the eschar of the caustic sloughs off. In some of these cases I have seen another curious act of nature, where, upon the falling off of the slough, and upon making a puncture, there was found an addition of new matter on the other side (the inside of the tunica vaginalis); and in one case the lancet went through full half an inch of this substance before it reached the water. I suppose, that in consequence of a breach being attempted to be made on the outside of any cavity, a particular irritation may take place, which produces this new matter or layer of coagulable lymph; as if nature was making the same opposition as we should do if a neighbour was endeavouring to make a way through the wall of our house; and as we could not prevent his

endeavours on that side, we should barricade it further on this side, by raising up another wall.

Case.—A gentleman applied to Mr. Martin, of St. Thomas's, for the radical cure. Mr. Martin applied a caustic, the eschar of which was dissected off, and the water let out. A little suppuration came on, and the wound healed. In a short time the sac was again filled, and I was consulted. I was of opinion (and from the account given by the patient I was confirmed in it), that the edges of the wound had come in contact with the tunica albuginea of the testicle, and there adhered, the cavity thus remaining, and that this adhesion had at last been destroyed. The cavity was laid open, the water evacuated, and the patient cured.

The part operated on should, with respect to the length of the sac, be made about the middle. To perform the operation with the tent, the tumour should be examined, to discover where the testicle is. The tumour is then to be held in the left hand, and the fluid pressed towards that side where the testicle is not; and then a puncture is to be made, about twice the breadth of a common lancet. The left hand is to be continued, to prevent the orifice in the skin and sac from getting asunder; but the pressure must be so much diminished that the evacuation of the fluid is not hastened by it, and the tent is to be introduced immediately. A sponge tent, in my opinion, is the best for the purpose: it should be held in the orifice until it begins to swell, to prevent its slipping out of the opening either outwardly or into the sac, as well as to prevent, as much as possible, the escape of the water. The tent is then to be retained by sticking-plaisters, &c., until suppuration has come on, which will shew itself round the edges of the wound.

The Seton.—This should never be attempted to be introduced with a common probe, as the water may entirely escape before it is passed through the second orifice: it should, therefore, be passed with a proper needle, and as I mentioned before, should be so large as to prevent the too quick discharge of the water, i. e. before the suppuration has taken place. I have of late used the following method:—I make an incision in the usual place, about three inches long, and as soon as the water is evacuated, I fill the cavity with a poultice of linseed meal, even introducing the finger to fill up every corner of the cavity; and, where it cannot be effected without, I introduce it made into rolls. The poultice is to be secured in by sticking-plaister, &c. This poultice is to be renewed occasionally, and as the cavity contracts, it will require to be lessened, of course; and, at last, will be entirely squeezed out as the wound heals up. I have tried lint, both dry and wetted with oil, the latter of which was preferable; but the poultice is superior to both, because of the probability of the lint remaining in some corner of the cavity entangled in the granulations, and there acting as a pea in an issue. The parts should be supported by a suspensory, and a tenfold cloth: the suspensory is of the utmost consequence. After the operation, the scrotum gets swelled and inflamed, and throbs, rigors, restlessness, and quick pulse come on, with pain in the back from the affection of the testicle. After the wound is healed, the testicle will appear a good deal enlarged; yet the greatest part of this tumefaction is not of the testicle itself, but is produced by the new granulations, thickened cellular membrane, and adventitious matter deposited in

the cellular membrane, in consequence of inflammation : this last will be soon absorbed, and the whole swelling will in time go off, which effect will be increased by friction with mercurial ointment.

ACTION OF MEDICINES.

Before I proceed to make any further observations on particular diseases and injuries, I shall say a few words on medicines, or rather of their action on the human body.

The living principle, I before observed, is susceptible of impressions which may be productive of action, either diseased or healthy, i. e. action productive of restoration : each of these may be brought on by medicine. Whatever affects the animal body otherwise than mechanically, must be in a state of solution. From our juices being chiefly watery, the solution of many substances can easily be conceived ; but they are likewise capable of dissolving earths, metals, &c ; nay, there is, I believe, hardly any substance which is not capable of being dissolved in the human body. Earth, and even iron, is found in animal substances upon an analysis, which must have been dissolved in the fluids, as well as essential oils, which may be detected in passing off by our excretions. Taste is one proof of the power of our fluids in solution ; for there is hardly any substance which is capable of stimulating, but what will give a taste if applied to the tongue ; thus, almost all metals held in the mouth for a little time will give a taste : the same thing most probably takes place with substances applied to the organs of smell. The blood, from its being so heterogeneous a fluid, may have its powers of solution inferred ; and as I suppose a necessity of solution in these substances to affect the organs of smell and taste, so, in like manner, I suppose the necessity of solution, not only for its introduction, but for it to affect the system. Simple water possesses much less power of solution than when combined with some other substances ; thus, by the addition of fixed air it becomes capable of holding earth in solution. From some similar combination, perhaps, the blood and other animal fluids derive their extraordinary powers of solution. Medicines, strictly speaking, affect the living principle only, except when acting chemically, as caustics ; they have the effect of irritating or of quieting, and these two contrary effects are generally to be found in the same substance, the difference resulting from the difference of quantity : thus, a small quantity of heat quiets, relaxes, and softens, but a larger quantity will stimulate. A stimulus may either produce a natural action, or increase one which has already taken place ; or it may produce a contrary action. Medicines may either stimulate or irritate ; by the former, I mean increasing natural actions ; by the latter, the production of excessive action, which did not naturally exist. The action of the same substance on different parts produces different effects, as well as in the same part when the action of the part is different. One diseased action may often produce the cure of another diseased action. Actions may be, first, of healthy parts ; secondly, action produced by stimuli or by irritators on healthy parts ; thirdly, action of diseased parts ; fourthly, action of stimuli and irritators on a diseased part. Irritators may produce very different effects on a healthy part, or whilst

disease already exists ; thus, mercury by its irritation will produce diseased action in a healthy state of the part. The venereal poison, by its irritation, will also produce diseased action in a healthy part ; but from the application of mercury to a part already affected with diseased action from the irritation of the venereal poison, an action results different from that which would be produced by the application of it to a healthy part ; for from the conjoined action of the two, results the action of health ; but if carried beyond that, it may do harm, producing its own specific action. Besides this, it is to be observed, that the venereal action, or, in fact, any other morbid action, may produce a disposition for other diseased actions, which may require only the absence of the former disease to allow it to come into action. These consequences are, therefore, to be distinguished from the original disease, otherwise the mode of cure may be continued too long, and that which might be curative of the first disease, may increase the consequent one. In a former part of the course I mentioned susceptibility, disposition, and action. It will be worth while to inquire, whether the same medicine can be capable of affecting all the three ; thus, for instance, will mercury destroy the susceptibility and the disposition for the venereal disease, as well as destroy venereal action ? We are confident of the latter, and we have cases which would make us think that it lessens the susceptibility also ; but as to its having any effect in lessening the disposition, I very much doubt ; but may perhaps retard it.

Case.—A gentleman had a chancre, for the cure of which he used a large quantity of mercury, both by friction and internally, which produced very little soreness of his mouth. The sore at last healed, and from the quantity of mercury which had been used, it was thought that the constitution was preserved ; but in a little time discolourations of the skin appeared : for these he drank a quart of sarsaparilla a-day, without their removal ; on the contrary, fresh ones appeared. I gave two grains of calomel twice a-day, and he was cured. Now I suppose, that a disposition for this diseased action might have existed before the first mercury was used, which disposition was by this not lessened, but only retarded, and the cure did not take place until the venereal action took place, which was then cured by the action of the mercury : the first mercury not preventing the disposition from forming ; and it thus appears, that what will cure the action will not cure the disposition. The ultimate effects of impressions, I have already shewn, are actions ; and I also shewed, that diseased actions were thus produced ; and here is the place to observe, that in the same manner actions may be produced destructive of that diseased action which had taken place. But disease is not always the consequence of impression, but sometimes of other circumstances ; thus, there may be a waste of the body from want of absorption of chyle from the intestines or mesenteric obstructions. There is no impression without a counter-impression. As the animal grows, it acquires various modes in which it may be affected. Medicines have visible and invisible effects. The simple visible effects may be divided into two, the one local, the other constitutional, or constitutional producing local. The local are vomiting, purging, &c. ; as an instance of the constitutional, the effects of mercury may be mentioned. Their invisible effects are commonly their specific effects ; for we find that their curative do not always de-

pend on their visible effects, as in the case of mercury producing salivation in the attempt to cure the venereal disease, and as is the case with many other medicines; but these sensible effects of medicines are often the measure of the quantity taken into the body.

STIMULANTS, IRRITATORS, AND SEDATIVES.

The two former are most commonly used by surgeons, because a want of disposition for restoration is more frequent than excessive wrong action, and also because a backwardness to heal is more apt to excite the idea of sluggishness than of excessive and wrong action, although perhaps even the latter may be the case. Medicines given slowly, and continued, will produce effects very different to those produced on their sudden application; and thus it is that even stimulants and irritators may produce weakness.

Action.—A strong part may have either strong or weak action; the same may be said of a part which is weak: the strength and the action to produce salutary effects should be in proportion to each other. The powers should be increased with the action; but it is too often the case that action is hurried on too fast, beyond the powers; thus, if a man is weak with loss of blood, his powers should not be too much exerted, as often is the consequence of taking cordials. The same is to be observed if a man is starving for want of food: it must be given cautiously. Where strength exceeds the action, then there is room for the use of stimulants. If the effects of medicines extended no farther than the point of contact, they would be very trifling, indeed; but their effects are extended much farther by sympathy. I have before shewn, that affections may be extended without any interruption, which I called continued sympathy; the same is to be observed of the effects of medicine being continued through a part by the continued sympathy. They also act sometimes by remote sympathy. Such sympathies as are continued and similar lose their power by distance only, and medicines acting thus may be termed local. But it is to be attended to, that the remote sympathetic action of medicines is not always the same as their effects on the part to which they were first applied. If the continued sympathy was not similar, and if the effect of any medicine on any part thus affected was not continued by that same similar continued sympathy through that part, how trifling would be the effect of such applications; and how could any application to the surface affect an inflammation which extends to a great depth, but by the same sympathy. The commonly received opinion respecting external applications is, that they enter into the pores of the skin and so reach the part; and on this idea practice was built. Parts were supposed to be relaxed and moistened by the joint effects of warmth and moisture; and on this idea warm baths were used to ruptures and dislocations. In many cases, indeed, very salutary effects were discoverable from their use; but these cannot be attributed either to their warmth or their moisture penetrating, for the warmth of a living part is not thus increased; and a living part may be immersed for ever in warm water without becoming moister, except where the water is

in contact: the good effects are thus brought about. The part to which the application is made is soothed and rendered easier, and the irritability lessened, which effect is, by continued sympathy, carried through the diseased part. In what other manner than by the soothing effects on the skin, communicated over the whole system, and taking off irritability and excessive action, can the warm bath act when used by a patient with suppression of urine? Moisture, surely, could be of no service here, even did it penetrate; and it can surely be only by its effects thus produced by contiguous sympathy that fomentations to the belly or chest are of service in complaints of those cavities. It is a fact well known, that vapour cannot enter the pores of bodies so well as fluids; but in confirmation of my opinion I may observe, that vapours are often of equal if not greater service than fluids, and that because, if moist and warm, they equally soothe the parts with which they are in contact. Bland oils, from their supposed penetration, have been also recommended in the same cases, and perhaps from their making a rusty hinge move better, or an old boot sit easier; but even oils do not penetrate the skin, so that, unfortunately for the animal body, if from any contraction of a muscle, or from any cause existing in a joint, the motion of that joint is prevented, not a particle of the oil can be made to reach that part; and, fortunately for the hinge, the oil can pervade its joint, washing away the rust. The idea of their penetration has been carried so far as to induce some to prefer the application of animal to vegetable oil, on the supposition that as it had come from an animal it would more easily enter an animal.

Oils, both animal and expressed vegetable, can have no particular action in these cases, the good resulting merely from the friction used in their application: nor do I suppose the essential oils to be more penetrating; they can only act as stimulants and irritators. Although I do not admit of this mechanical penetration of substances, I have no doubt of their absorption by the action of the proper absorbing vessels: thus, mercury applied to the thigh is absorbed and carried through it; but it is not rubbed on the bubo, which can only be affected by its sympathizing with the skin.

PRESSURE AND FRICTION.

These, in some respects, produce similar actions. Pressure in a small degree only stimulates, and thereby produces a thickening of the part, as if for its further defence. If the pressure is increased, then irritation and inflammation come on. Pressure produces increase of action by first impeding action; the impediment acting as a stimulus on the part; but friction produces increased action directly. Friction may be assisted by stimulating or irritating applications.

HEAT, COLD, AND ELECTRICITY,

Produce effects not only at the part to which they are applied, but much deeper also. Water, as it conducts it quicker, is a much better conductor of heat than air. Cold

bathing produces very different effects, from its mode of application and from the state of the constitution at the time. By its quick and sudden application, the power which the body possesses of forming heat is called up and exerted, and a glow of heat is soon felt on the surface: this is what is experienced in a strong constitution; but if it is too often repeated in the same day, or the constitution is weak, instead of being refreshed, the person is more languid, is chilly through the whole day, the constitution not having sufficient power to restore immediately the degree of heat lost. Heat would seem to be produced in the vital parts; and it is to be observed, that both birds and beasts have warmer clothing over their vital organs than their extremities, which abound more with oil, even in the bones. Action from the application of cold may be diseased, being sometimes the action of weakness: it may also act by sympathy, as cold applied to the back will stop a bleeding from the nose. Applied to the skin, it will give pain in the intestines, and produce a relaxation of the bladder. In a sprain it is common to pump cold water on the part, as it is supposed to increase action in old sprains. I believe it is not so plainly indicated, except where the constitution is sluggish. Heat pervades all matter: the quality made evident to our senses is here meant; for the matter of heat is found to be more in some bodies than in others, though their sensible heat may be the same. Heat may be native or foreign; the latter I mean to consider here. Heat may be either a stimulant, irritator, or sedative. It tends directly to increase action, cold to lessen it. This case, explaining my idea of the necessity of adapting action to the strength, may be introduced here.

Case.—A child with fever of the putrid kind, and sloughs in her throat, was very low and weak: she had taken bark, and had been blistered. I was called on account of a large slough appearing on the blister, to which I applied poultices with opium. It was proposed to apply stimulating applications, which I objected to, on the idea that action had been already beyond the proportion which it ought to keep with the powers of the patient. The warm bath was likewise proposed, and on the same grounds objected to; but it was tried, and my opinion confirmed by the ill effects it produced: in fact, in such a case as this, I should be careful of not increasing action far; for as it is spared, so must the powers and the strength be preserved. Dry heat is best applied by such spongy bodies as part with their heat slowly, as bricks, bread, &c.

Dispositions succeeded by actions which are their cure, as is the case in fever, gout, and abscess following inflammation, the disposition ceasing when that action has taken place. In the same manner the mind has also its disposition, ceasing when its actions are produced, and is relieved as well as the body as in the foregoing cases. Action may be great where the strength is small, and this from the irritability being great. The action may destroy the disposition, or only for a time, it being then renewed; or it may not destroy the disposition; or the action may go on, as if from habit, until stopped by some unnatural circumstance, as medicine. In the second case, the disposition recurs, because its original cause exists: this is the case in ague. If an ague stop at the cold fit, debility is the cause; if at the hot fit, it is with strength and great action; if it concludes with warm regular sweat, the disposition is taken off for a time; a cold and

clammy sweat shews the imperfection of its action. Fits of all kinds are actions of this nature ; for the disposition will have been on the patient for some time before, and may have been discoverable to the patient. The third case is, where the action does not take away the disposition, as in the lues, cancer, and probably in many continued diseases. By the action of vomiting the disposition for sickness seems to be taken off, and its recurrence at intervals, owing to the remote cause still existing there ; and probably in the same manner the fits of pain from stone in the bladder are produced. Causes may produce a disposition, and that may bring on action at some distance of time, although health may intervene.

Case.—A young man applied a strong solution of sublimate for the cure of an itching of the pubis ; by this application a violent inflammation was produced. I ordered lime-water to wash the parts with, and a poultice with lime-water and thebaic tincture. I also ordered the bark to be given, and the apothecary thought it proper to give a vomit first, when, during its operation, a very considerable quantity of blood was discharged, both by vomit and stool. Dr. Heberden ordered tincture of roses, &c., but without effect. Seeing the patient nearly dying, and well knowing the good effects of turpentine in stopping bleeding externally, I gave him two spoonfuls every two hours of an emulsion made with Chio turpentine : cold water clysters being also used. He recovered, and got strong and fat; but some time after dropsy came on, which was also cured. Now a disposition for a diseased action was here formed, which action did not take place directly, but some time intervened, in which he enjoyed a good state of health.

Some parts possess more power than others. Muscles and skin soonest heal ; next to these, but not nearly so soon, the cellular membrane ; bones, tendons, ligaments, &c., least so. The connecting membrane has not the same power every where. The sensation of those parts which are backward to heal is not so great as those which are quicker, as in the tendo Achillis. There is a difference at different ages. Ages I divide into those of growth, stationary, and decline. The powers of restoration may be ranged in the same order, and may be supposed greater in a child of two years old than in one which is younger, because it now has strength adding to its powers of growth, the increase of strength being in an inverse proportion with the growth.

Of one disease curing another, it may be remarked, that a local disease proceeding from an universal one cannot be from sympathy. That a constitutional disease may cure a local one, in consequence of the universality of this new action, it must extend to that part, and may there destroy the old diseased action by bringing on this new action ; thus during fever an ulcer of some particular diseased kind may be healed up, its particular diseased action and the febrile action forming a third, or the action of health, whilst, perhaps, a simple ulcer would have been aggravated by the fever. Constitutional diseases sometimes cure themselves, or, as it were, wear themselves out without any crisis, or taking on complete action. One local disease cures another : this is either by contiguous or remote sympathy ; thus headach is cured by seton in the arm, as also toothach, and disorders of the eyes. In the same manner an inflamed testicle cures clap ; but the inflammation of the testicle is not removed even by the return of the clap.

Lues may produce another disposition for disease, requiring a different cure. Local may be cured by constitutional, but may have reflected back on it the same disposition, or that from which the constitutional action proceeds.

There is no disease but has a mode of cure peculiar to itself; nor is there a part but has its particular action for its restoration. Restoration seems, in general, to depend on the same principle as that original principle on which depended the first formation of the parts, the disposition of the parts being given in that manner they go on to increase. Nature, indeed, sometimes deviates; but it is with regularity: we find changes take place, sometimes only in consistence, but sometimes the change is considerable. All this is, in general, an extension of the original principle; but we sometimes detect nature acting by a different principle, creating, as it were, new parts, and those even different from the old ones, as where a new joint is formed where the end of a dislocated bone is lodged. Nature's adherence to her original principle may be exemplified by observing, that in the regeneration of a bone which was originally cartilage, as the long bones, there cartilage is first formed; and where it was originally membrane, as the bones of the skull, there membrane is first formed.

GUN-SHOT WOUNDS.

The whole of the first effects of gun-shot wounds are accountable for from accident merely, but are capable of afterwards degenerating into disease. Under gun-shot wounds have been comprehended not only those which are strictly so, but those from splinters of wood, pieces of shells, cannon balls, &c.: but these are, in fact, very different. Those which are strictly gun-shot wounds, as those from musket-balls, have part of the solids deadened by the passage of the body through them, and must, therefore, be allowed to suppurate. These wounds vary with the kind of body by which they are inflicted, with the degree of velocity, and the nature of the part injured. Inflammation is less here than in other wounds, the inflammation being in an inverse proportion to the quantity of the part deadened; in some instances, indeed, the inflammation is equal to what it might have been had not the injury proceeded from gunshot wound, as where a compound fracture is the consequence of such an accident as much inflammation occurs as when the fracture is produced by any other cause, because the quantity of part deadened does not bear any proportion to the quantity of injury. These wounds are seldom, perhaps, well understood until the slough, having separated, shews what parts have been hurt, and how much injury they have sustained. They sometimes admit of being classed with the small and deep-seated wounds. A gentlemen received a wound from a pistol-ball near the navel, the ball passing to the side, where it shewed itself. I extracted it, and was very much surprised to find a good deal of air pass out at the wound, which seemed not to go deeper than the muscles. I lately saw, at St. George's, a man whose skull was fractured in consequence of the two sides being pressed together: he died a little time after the accident. The cellular membrane of the scalp was distended with

air ; but I had no opportunity of discovering how it came there, yet suppose it might have been introduced by the nostrils, to which opinion I am led by just recollecting a case which once occurred to my observation. An officer came to me with his face very much swelled, and emphysematous. The account he gave me was, that upon blowing his nose forcibly he felt something in the corner between his left eye and nose give way. The air had here so forcibly distended the lachrymal sac that it had burst, and the air was effused through the cellular membrane.

To return to our subject. If the velocity of the ball is but small, so is the mischief ; but if the velocity of a ball is just sufficient to break a bone, the bone will be more splintered than if the velocity had been much greater : still much depends on the hardness of the bone, the splinters being more as the bone is harder. The slough or deadened solid is in proportion to the velocity of the ball ; and for this reason, it is greater where the ball entered than where it went out ; the greater the velocity, the cleaner is the wound, although the slough will be greater. I can easily conceive that even a sharp cutting instrument might be applied with so great a degree of velocity as to deaden the edges of the wound made by it. As is the velocity of the ball so will be its direction,—if great, in a straight line, *cæt. parib.* and *vice versâ*. The healing of the wound is slower as the velocity of the ball is greater. The most dependent orifice generally heals soonest ; and this seems to me to proceed from the extravasated fluids in the cellular membrane settling round the depending orifice, whereby it is sooner closed. This will more certainly be the case if the depending wound was that at which the ball went out, as was before observed ; and this last circumstance will have the more sensible effect if the ball was a spent ball, because the ball may have passed with such a considerable velocity that its passage through the part might produce little or no alteration in its velocity. The wound produced may be either simple or compound. Simple, when the ball has passed through the soft parts without any particular part being injured. The compound may be, first, with a fracture, or with a wound of a large artery ; secondly, when it penetrates a large cavity, this may be again divided into where it only penetrates and where it actually injures some of the viscera contained in that cavity. The treatment of gun-shot wounds has hitherto been that of dilating the wound ; but I can see no peculiarity in these wounds requiring this practice, which is so opposite to the treatment of other wounds. It appears as if former surgeons had directed generally for these wounds to be thus dilated to allow of the search after extraneous bodies ; but often finding extraneous bodies remain in the wound, they lessened their search after them, but continued their practice of dilating, from the generality of its adoption : in my opinion this practice, as a general one, should be rejected. This opinion I formed on the following facts. At the taking of Belleisle four French soldiers and one of Lord Loudon's grenadiers were wounded in the following manner :—A. B. was shot through the fleshy part of the thigh ; B. C. through the chest ; C. D. through the joint of the knee ; D. E. was shot with a musket-ball, which entered at the insertion of the deltoid muscle, passed through the joint of the humerus, and was lodged just under the skin in the back : his arm was extended when he received the ball. E. F. had a ball pass between

the biceps and the bone. These had all hid themselves in a shed, and were not discovered for some days afterward; when I, perceiving that the wounds were going on very well, only dressed them superficially, and they all did well. Now every one of these would have had their wounds dilated if they had been seen at the first. It would, indeed, be absurd to suppose that no gun-shot wounds require dilatation; I am only contending, that it is not necessary merely from its being a gun-shot wound. In a simple gun-shot wound, passing through a fleshy part only, I can see no good effect which could occur from the opening it; and if the ball did not pass through, no good can follow from the dilatation with a view to obtaining the discharge of the ball, or any other extraneous matter, if it is not at the first in our reach; for let us suppose that a wound made by a ball would be six months in healing, let that wound be dilated, and I will engage that in one month's time the wound will be as much closed as if it had not been dilated, and therefore the extraction of the ball or other matter will be as difficult as if no dilatation had been made: therefore opening at the first, on account of extraneous matters, unless they can be easily got at, cannot be of service; and even if they can be readily got at at the first, it must not be from merely that circumstance that we should be induced to dilate the wound, for they may come away more favourably at a later period: for the canal will suppurate, splinters of bones must separate, suppuration will take place around such substances as are inimical to the part, whilst those which produce no irritation do no harm by their stay. The defenders of this practice say the tension of the wound is taken off by this dilatation; but I should expect a different effect to follow. It is in the compound wounds that this dilatation is chiefly required; and where it is required, it is best to be done before the inflammation comes on; for if no particular relief is had by the incision, then the inflammation is increased. Of the circumstances requiring incision it may be impossible to enumerate the whole, but some I will mention: first, where any extraneous matter may be easily extracted; secondly, where a large artery is wounded; thirdly, where a fracture of the skull is suspected; fourthly, where there is a fractured piece of bone which may be extracted, and which might do harm if left (and it may be here observed, that gun-shot compound fractures will more seldom admit of being treated as a simple fracture than if from other causes); fifthly, where it is necessary to the reduction of any prolapsed part; sixthly, where some vital part suffers pressure from any substance which by an incision may be removed. Balls entering the larger cavities do not demand a dilatation of the wound for the search after them, as they cannot be followed in the cavity: so in the face, where a ball penetrates, we cannot follow it in the bone. In gun-shot wounds the ball generally carries in the piece of skin with it.

The present practice is, not to regard the balls themselves; wherefore we may suppose that this general practice of dilating these wounds is not on their account, for it is well known that they have not a power of doing harm even if left in. If the ball has only run along just under the integuments, it may be traced by the appearance of a red line in the skin just over its course; not inflamed, but a kind of blush: this may be sometimes seen where the course of the ball has been deeper. Their course is sometimes

very winding: this will be according to the velocity of the ball and the opposing parts, a spent ball being more easily turned out of its direction than another, and where even the velocity is considerable it may have its course easily altered, by being opposed in an oblique direction; and this more particularly if the opposing part is a bone, a ball may run almost half round the body. Supposing it to enter between the skin and ribs, then the alternate impulses it receives from the skin and from the ribs will prevent its entering the chest, or passing out through the skin, though its quantity of motion impels it forward. I have seen a case where a ball had entered on one side of the tibia, and had passed half round that bone, and gone out at the opposite side, without hurting the bone in the least, and the skin only at its entrance and exit: the balls in both these cases must have been, in a great degree, spent balls. It may here be observed, that in such a case as the latter the cure might prove more expeditious if the canal formed by the passage of the ball was entirely laid open, as the skin would have so little disposition to unite with the muscles underneath: the course of the ball may appear to be winding, and this from the parts not being in the same situation as when the ball was received. Forceps are now almost useless, but not quite so; for suppose a ball just under the skin, and that ball so much a spent ball as to make no slough, then the wound may heal, and even by the first intention, and close the ball in; to prevent which, it should be extracted: but where there is a slough, let that loosen, and the suppurative process come on. If the two wounds are very distant, then an opening may be proper somewhere between them, for the more easy passage of any extraneous matter. If the ball can be easily got at, we need not wait for the separation of the slough. The parts must be more injured at the entrance of the ball than where it went out, or more particularly where it is lodged, as this depends on the velocity, which in a spent ball will be easily lessened, but is not so common in the case of a ball which passes through, as the velocity may have been so great as not to be altered by the trifling opposition it may have met with.

WOUNDS PENETRATING THE LARGER CAVITIES.

These may be either gun-shot wounds, or those made by some sharp weapon, as a sword, bayonet, &c. Their dangerous effects are chiefly the injuries which the contained viscera receive; for this reason I divide them into those which only penetrate, and into those which have injured the contained viscera: the first of these are not attended with much danger, if the proper means are used; but the most proper means are generally unsuccessful in the latter. In a penetrating wound of the abdomen, where no viscus or bloodvessel is injured, the integrity of the cavity should be again produced, and as soon as possible. If the wound be from gun-shot, and the velocity has been great, then a considerably large slough may separate; but the adhesive inflammation coming on will secure the cavity of the abdomen, by forming a complete canal of the passage of the ball, excluded from the cavity of the abdomen, in which canal the extraneous matters will be contained, and whence they will be discharged when the suppurative inflam-

mation comes on. The penetrating wounds injuring any viscus will require to be treated according to the nature of the part, and its complications. If the liver is wounded, the patient will feel a sickly heavy pain in the part, and a pain in the shoulder; if the stomach is wounded, the same sickening kind of pain is felt, and blood is thrown up by vomiting; if the intestines are wounded, blood is voided with the fæces, and the pain is more or less sickening, as the intestine is near or not to the stomach; the higher the more sickening, the lower the more acute. If fæces are discharged by the wound, then some guess may be made from what part of the intestines they have proceeded. The bladder or kidney being wounded, blood will be seen in the urine, but no extraordinary pain: the spleen affords no particular symptom that I know.

Wounds of the liver, spleen, &c. may produce no other than their primary symptoms; but it is not so when, from a wound of the gall-bladder, intestines, large bloodvessel, &c., the contents of these being extravasated in the abdomen, which give rise to other symptoms. But sometimes, even in these cases, if the wound is small, none of these effects may follow, as the adhesive inflammation coming on may prevent this mischief. Wounds of the ductus communis choledochus and ductus pancreaticus may produce the same symptoms, but more slowly.

Where a part of the viscus has been only killed, we shall have this difference:—the contents of the viscus will not be extravasated until the slough of the deadened part falls off. In such a case nothing but superficial dressings can be employed. The slough will probably fall off in about twelve or fourteen days, when, by the adhesions which have been formed, the contents are discharged outwardly.

Case.—A gentleman received the balls of a musket, three passing through his body, making only two holes at their entrance, which was a little to one side of the navel, and at their passage out, which was near the vertebra of the loins; but made three holes in the wainscot behind him, two of which were near together, shewing that two of the balls had entered by one orifice. He made water some time after, which was bloody, by which we learned the kidney was hurt; but this soon went off, and for a fortnight no symptomatic fever came on, nor no secondary symptom appeared. I now declared him to be out of danger, concluding that by the adhesive inflammation a complete canal was now formed, by which any extraneous body, as part of the clothes, &c., might be discharged; but upon observing fæces come away from the wound, an alarm was given, and my prognosis suspected; but I still continued firm in my opinion; for I knew that from this not occurring earlier, it was the consequence of a separation of the deadened part of the intestine, but that, as the canal formed by the adhesions was complete, there was nothing to be feared but the necessity of preserving the wound as an artificial anus: this, fortunately, did not happen here, the wound healing, and the patient doing well. Indeed, where part of a large bloodvessel has been thus deadened, there may be even sudden death from the extravasation of blood at the separation of the slough.

WOUNDS OF THE CHEST.

The lungs being wounded does not necessarily produce death. There is generally less bleeding from a gun-shot wound than in a wound by a sharp instrument. Another advantage sometimes is to be had from a gun-shot wound which is not to be had from a wound with a cutting instrument, which is, that in the former the wound remains, in general, sufficiently open to allow the extravasated blood to pass out: this, indeed, is in some measure overbalanced by the exposure of the cavity; but it does not appear that this mischief comes on so readily in the chest as in the other cavities. The lungs immediately on being wounded, an opening being made and not immediately closed, collapse, which prevents adhesion from taking place. If the lungs are wounded, the bleeding may be very considerable: blood is thrown up by coughing, and if there was no adhesion already where the wound was made, blood will be extravasated into the cavity; this, if small, will be absorbed; but if in great quantity, will produce other symptoms, as faintness and lowness, proportioned to the quantity of blood discharged, and to the time in which it was discharged, oppression and seeming weight, difficulty of breathing, some part of which may be produced by the wound of the muscles merely. From the cavity being nearly filled with blood, the patient cannot lie down, but is obliged to sit up.

Case.—A gentleman was stabbed behind the left breast: he discharged nearly a quart of blood by coughing; his breathing was difficult, and his pulse quick: he was bled, and every one thought him dying. He could only lie on his back, but his easiest position was sitting up: he did not spit up any blood after the second day. I proposed the operation for the empyema; but as he seemed rather better, it was not permitted: he at last died, suffocated as it were. Upon opening him, there was found three quarts of fluid blood in the cavity on that side. The blood was not coagulated, but had a coagulated substance in it, which seemed to be the coagulable lymph which had been furred over the lungs and pleura; the heart and pericardium were also inflamed, and covered with coagulated lymph.

Wounds of the lungs generally produce a quick but small pulse, in consequence of their affecting the passage of the blood through the lungs, and the part wounded being a vital one. If the wound is made by a ball, there is little to be done, as it will generally allow the escape of blood; but if the wound is made by a sharp instrument, and we are convinced that the symptoms are produced by blood extravasated into the thorax, then the operation for the empyema should be performed, and, if possible, before the blood coagulates: sometimes the enlarging of the first wound will be sufficient, and that will be when, from its situation, it can be made a dependent one.

ACCIDENTS.

These are curable or incurable: the latter may be divided into two kinds; one, where the part hurt can be removed for the relief of the patient; and the other, where it cannot.

Where the first of these is the case, it ought undoubtedly to be done; but perhaps it will not, in general, be right to do it directly, but the inflammation from the accident may be suffered first to pass over, except, for instance, in the wound of a large bloodvessel: certainly nothing can be more improper than the operating on the field of battle. If the inflammation is expected to be so great as there to be danger of its killing the patient, then the operation should be performed before the inflammation comes on: if it is not expected to be so great, then it may come on and pass off before the operation is performed. Bleeding has been particularly recommended in gun-shot wounds; but it is not particularly useful in these more than in other wounds. Here, as in other wounds, if there is a full pulse, great inflammation, and symptomatic fever, bleeding may be proper: but here also, as in other wounds, I must own, I should not always bleed to such an extent as the inflammation, &c. may, at first sight, seem to demand; for when the present increased action ceases, we shall find that the patient's real strength may be so low as to require our utmost care to support him with cordials, bark, &c. The bark has been greatly recommended in gunshot wounds, and, in many cases, with great propriety, I think; but these are when the inflammation has gone off, or, if it exists, the patient is low: if, after the inflammation has gone off, the pulse should rise, I think bark is to be recommended, with small bleedings, as the latter may prevent present ill effects, while the former, by lessening irritability, may prevent future. Where exfoliation is necessary, the bone should be exposed freely, as that will produce inflammation, and inflammation is, I think, necessary to that process. Where the mouth of a fistulous ulcer, leading to an extraneous body, is inclinable to heal, I would permit it, because, if the substance will not remain peaceably in the flesh, it will form an abscess, the opening of which must present the readiest passage for that body: there may, however, be exceptions to this practice. Wounds which are fistulous, but which contain no extraneous bodies, have diseased bottoms which may be considered the same as extraneous matter, and as such their removal must be necessary: large openings being made in these cases, inflammation is excited, by which the beneficial effects are produced.

INJURIES OF THE BRAIN.

Concussion of the brain, and compression from external violence, produce apoplectic symptoms similar to those from internal causes, such as total or partial cessation of sense and motion, stertorous breathing, &c. These should be distinguished from those of mere fainting, which arise from a want of due compression of the brain, as from loss of blood. Vomiting is another mark of injury done to the brain; but to have this, the patient must not be quite deprived of sensation; and, agreeably to this opinion, we may observe, that this symptom happens among the first of those from compression, then ceases, and, if it returns, it seems to be with the return of sensation. Sometimes, from a blow on the head, a very considerable inflammation of the erysipelatous kind will seize the scalp, and which will sometimes be attended with excessive pain in the head, and

even delirium ; in which case I suspect the brain to be in some measure affected with the inflammation. Symptoms of concussion come on at the first, and may be removed by large bleedings ; but concussion may be joined with compression, and that either from depression or extravasation. I have let out matter nine days from the accident, and in another case not till a year afterwards.

Case.—A gentleman, for two years, after receiving a blow on the skull, was delirious. I felt a little depression, and applied the trepan, and took out a piece of bone, which had been depressed all this time, part of the internal plate of which was absorbed, and pus was lying on the dura mater.

Bleeding from the nose and ears sometimes accompanies fractures of the skull ; but this may occur without fracture. There will, in general, be less concussion where there is a fracture than where there is not, because the parts have yielded to the blow. Depression may take place in children without a fracture. I have seen one case where the person died from matter collected on the side opposite that which received the injury. The perforation of the dura mater is not to be performed unless we are quite sure of matter or blood being under it, and pressing on the brain : I cannot say that I have been fortunate enough ever to have a patient recover where the dura mater was perforated. Trepanning has been forbid on the sinus ; but I see no harm which can result from the operation, where it is necessary. A simple incision may be sufficient to search for and trace a fracture, which should be done to its utmost extent ; but if trepanning is determined on, then it is best to make a crucial incision, that there may be no incumbrance to the operation. Care should be had in making the incision, lest the knife slip in the fracture, and so into the brain. The best dressing both before and after the operation is, I think, a poultice.

DISEASES OF BONES.

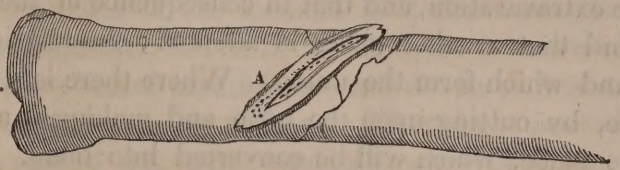
Bones have been hitherto considered in their growth, as well as their structure, to differ very much from all other parts ; and for the same reason their diseases have been supposed to be different from those of other parts : from this resulted a difference also in their treatment. One circumstance which probably gave rise to this might be, that diseases of the soft parts leave seldom any vestiges when they are cured ; but those of the bones generally produce such alterations as remain during life, and, from the permanency of the bones, a much longer time ; so that a person may in a churchyard see a variety of diseased bones. In fact, the diseases of the bones are the same as those of the soft parts, they being susceptible of all the kinds of inflammation, and their various consequences ; but, unluckily for bones and their covering, they cannot ever swell without its being suspected to be venereal. Nor can they require a different treatment as regards their vital power from the soft parts, though they may in the mechanical part of them, arising from the solidity of their form, not recovering so fast as the soft parts. This may be either from their naturally possessing less power than the soft parts, or from

being deficient in their natural power. We sometimes find the hardest bone the readiest of cure; but this is where the death of the part of the bone is necessary for the cure; and this we find takes place soonest in the hardest bone. In other respects I should suspect that a hard bone requires as much time as the other. Diseases of bones often become very serious, and that sometimes from our ignorance of how far their morbid alteration may extend, as well as of its nature; for though we may feel a tumour of the bone, or discover a fistulous opening leading into a cavity of the bone, still we obtain from this but little information of the state of the disease. Bone deprived of its periosteum generally suffers death, and is exfoliated: this may be observed in the projecting end of the bone in a stump, where the periosteum has been destroyed; for the piece loses its living principle, and is thrown off. Inflammation of bone, as well as of the soft parts, may produce death in the part; so may exposure also. We have been informed of dry and moist caries: now the real difference between these is, that in the dry caries, as it is termed, the bone is become entirely dead, but in the moist the bone is in a diseased state and affords a discharge, but is not dead. When it was perceived that the dry caries only exfoliated, the actual cautery used to be applied, on the idea of drying the moist caries; but this was done without knowing the principle on which it was done, viz. that of entirely destroying the life of the bone. Bones are very much disposed to fall into diseased dispositions and actions; and oftentimes a very slight accident will convert a disposition into action, as in scrofula, and this may again be increased by the part of the bone which is injured; thus, in the case just related, the effect is most considerable when it happens at the end of a bone forming part of a joint. A diseased bone should be well distinguished from a dead bone. Ulcers of a bone are exactly the same in their immediate causes as those of other parts, and in some of their effects also; the difference being not that of disease, but of structure. They admit of all the varieties of disease which other parts do; they admit of the contiguous and of the interstitial absorption, and are also liable to absorption from all the causes which produce it in other parts; the most common is pressure, which may be from tumours, blood, pus, &c. Bone is capable of being absorbed into the constitution: this I believe is, in general, from debility, because they cannot support themselves; and this most commonly happens to newly-formed bone. Bones are absorbed themselves, to get rid of the dead part; but they do not seem to be thickened by pressure, as the soft parts are. Disease in bones is generally communicated to the neighbouring parts, as the periosteum and cartilage. If a soft part requires to be killed, we may apply a caustic; but if it is a bone, the actual cautery must be applied.

Injuries of bones from accident are never to be reckoned as disease, so long as the bone retains its power of restoration, in common with the other parts of the body. I suspect that inflammation will come on in a bone more readily than in the soft parts, because less capable of counteracting any injuries. Mischief done to a bone may be either with or without exposure, which produces a great difference in the effects. In the simple fracture of any bone, an union may take place similar to that which occurs in the soft parts. This may happen in some cases even without the adhesive

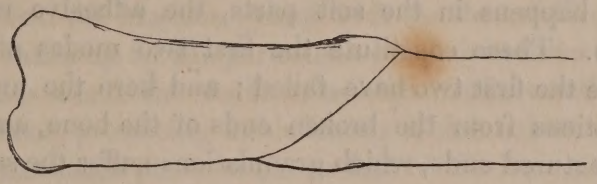
inflammation; for in the blood which has escaped from the ruptured vessels, or in so much of it as is fit for a matrix for vessels, as the coagulable lymph, vessels are formed, by which a living substance is produced; then the arteries and absorbents, by their mutual action, model the part, and form it into a cellular substance, into which the arteries deposit calcareous earth. It is first formed into cartilage, then into bone: thus is callus formed. The splinters of the bone may be either connected with the bone or the surrounding parts, or may be entirely detached; but even in this case the splinter does not always appear to lose its living principle, for in this bone

Fig. 1.



the splinter A (*Fig.* 1) having by some extraordinary circumstance been turned round on its bone, so as it must have been quite detached, its periosteal surface is laid on that of the bone, and the internal or reticular surface presented to the muscles; but what is extraordinary is, the strong bony attachment by which it is fastened to the original bone, when, from the change it had suffered in its situation, it must have been entirely detached. In these bones you may perceive in how nice a manner the broken ends of the bones are rounded off and smoothed (*Fig.* 2). I think that splinters

Fig. 2.



This was meant to shew in what manner the projecting ends are rounded off.

are more common than are generally supposed, and this I infer from having observed that, in almost all the compound fractures I have seen, there have been splinters, and that where the circumstance which made the difference between the simple and compound fracture could not make any difference with respect to the splinters. The modelling of the callus to the parts in its neighbourhood is very evident in ribs that have been fractured, for on that side next the lungs the inequality is very inconsiderable. Whether this modelling, in these cases, is purely from the mechanical pressure of the lungs, or whether it is from absorption, in consequence of that pressure, I cannot pretend to say. The formation of callus is similar to the original formation of the bone. In fractures the constitution will be affected in proportion to the degree of the inflammation. In fractures where great inflammation is expected, rollers and splints should be applied very cautiously, if at all, the bones being placed as nearly as possible in their natural position, and wrapt in cloths dipped in aq. saturnina: perhaps cloths dipt in solution of opium may be useful in case of spasms from the splinters. Little alteration is to be made in the position of the broken ends of a rib, scapula, or of the os femoris near its head. It was, I believe, the old practice to lay the patient on his back, and the limb in a line with the body, in a fracture of the lower extremity; and it is a practice of late

introduction to lay the patient on his side, as well as the limb; but surely, I think, the former must be the best and easiest posture: time will shew whether the latter is an improvement, or only mere caprice. The time in which the bone is repaired will depend on the quantity of uniting matter, as this must be changed from cartilage to bone; on the age, constitution, and quantity of mischief: if it is a fracture of the lower extremity, the bone will not be so soon united as that of the upper. In general, there will be no motion at the fracture at the end of three weeks.

It sometimes happens, that the first two modes of union have failed; viz. that in consequence of the mere extravasation, and that in consequence of the adhesive inflammation; and here we find that another mode is adopted; granulations arise, which are changed into bone, and which form the union. Where there is a defect of bony union in a simple fracture, by cutting upon the bone and making it a compound fracture, granulations will take place, which will be converted into bone. When there is this deficiency, entire rest is not to be preserved, as the irritation from the motion may be of service, producing the stimulus of necessity, as a loose tooth may be fastened by the use of it in eating. It will appear from what has been said, that I am of opinion that the bony union may be produced merely by the conversion of the extravasated blood or coagulable lymph into a vascular substance, which becomes, by degrees, cartilage, and then bone; and this union may take place by the first intention, without even the adhesive inflammation coming on, similar to what may take place in the soft parts; and that, similar to what also happens in the soft parts, the adhesive inflammation may be necessary to the union. These constitute the first two modes of union of bone: the third of these is where the first two have failed; and here the union is effected by the production of granulations from the broken ends of the bone, and from the soft parts comprehending the fractured ends, which granulations suffer the same change into bone. I have seen a simple fracture where the first two processes, i. e. the conversion of the extravasated fluid into a vascular substance, and of that into a cartilage, had taken place, but the last stage, or the conversion into bone, had not succeeded; and upon allowing a little motion the parts got firmer, and at last perfectly strong. It sometimes happens that the fracture will not unite at all, all the three modes having failed; and here a kind of false joint is formed: the ends of the bone become covered as if with a cartilage, and the soft parts surrounding it become firm and polished, and often contain a fluid which is generally a bloody serum, but sometimes seems to approach to the nature of synovia.

Inflammation of bones differs very little, in many things, from the inflammation of the soft parts, having pain, &c. in common with these, and, like these, being susceptible of the three kinds of inflammation, adhesive, suppurative, and ulcerative; but some of the consequences and of the processes which take place in bones being very different, renders it necessary for the inflammation of bones to be treated of particularly. One of these particularities in the inflammation of bones is the formation of new bone, which happens by the adhesive inflammation, which I then term the ossific inflammation; the suppurative seems to differ very little from that of the soft parts; the ulcerative removes parts of the bones, and even of that which has been formed by the adhesive inflammation.

In the *adhesive stage*, the swelling comes on some time after the disease has begun: its not coming on earlier may be owing to the hardness of the bone not allowing it to give way. It is not, indeed, easy to conceive that this should happen from extravasated matter; but it is impossible to conceive it to arise from any other cause. In adhesive inflammation of the soft parts I have observed that coagulable lymph is thrown out: the same thing takes place here; but with the extravasation of the coagulable lymph there is here a deposition of calcareous earth; this occurring in the body of the bone, a swelling of its substance takes place, not only outwardly, but also inwardly, by which the cavity for the reception of the medulla is diminished. In cylindrical bones this swelling is generally nearest to the ends, which is the last formed part of those bones, agreeably to what I have before mentioned—that the more late a part has been formed, the more weak and less able to resist disease. The pain is more violent in the inflammation of bone than in that of soft parts; and this pain is generally worse at night, which is a circumstance common to all diseases of the bones and periosteum, although it has been supposed to be a characteristic of the venereal disease. In this state the constitution is but little affected, except from the pain, which may sometimes be so violent and tedious that the patient may, in the end, be considerably affected by it; nay, it is possible that the pain from diseases of bones may affect the constitution more considerably than that of other parts: this is certain, we oftener see hectic from this cause than from any other. The surrounding parts sympathize with the bone in this inflammation; first the periosteum, and then the muscles, which adds to the swelling. This ossifying disposition is also often taken up by the periosteum, and sometimes by the soft surrounding parts. Here are bones where the ossific or adhesive inflammation had taken place in the substance of the bone, producing a thickening of that substance of the bone; others, where inflammation has taken place on the surface of the bone; and here, similar to the exudation of coagulable lymph on the soft parts, a coat of adventitious bony matter is laid on the surface of the bones by the ossific inflammation. This in some, you may perceive, is laid on so close and so thin as to give the appearance of an ossification of the periosteum; in others, this is laid on loosely, being capable of being shelled off in places. In this bone of a lion, it is laid on in places nearly half an inch thick, adhering closely to the bone; and in this it appears, from the little connexion it had with the bone, that the bony matter had grown from the surrounding soft parts. From this preparation of one of the bones of the lion, which had been injected and steeped in acid, it appears that this newly added bone was vascular, and had only lost its earth by this steeping, its form still remaining; it therefore must be as much an animal substance as the original bone. This appearance on the surface of bones, some years ago, before I gave these lectures, would have been supposed to have arisen from a caries. If a bone is bent, broken, hurt, &c. the consequent inflammation produces an addition of adventitious matter which will strengthen the part, perhaps, beyond even what it originally was. In diseases of the bones, where the ossific disposition does not exist, we may observe that the periosteum is very slightly attached to the bone, being as easily raised from it as the cuticle may from the skin. The treatment of the adhesive inflammation

of bones chiefly consists in bleeding, rest, and proper position. Fomentations will give ease, especially if there is no depth between. By proper treatment this inflammation will be cured; but sometimes it goes on to the suppurative directly, and at other times, the bone may take on an indolent disposition. The newly formed bone is to be reckoned a newly formed part, and, as such, a weakly part. When the bone takes on an indolent disposition, the vessels must be roused into action; and this is best done, I believe, by the use of mercury, the treatment of inflammation of the bones differing very little from that of the soft parts. The mercury for the above purpose should be used in a quantity between that which is meant merely as an alterative and that which is meant for salivation. Besides this remedy, the mezereon root may be used, as recommended by Dr. Russell. This remedy has been used successfully in cases which were thought to have been venereal, and in others which were not. Now, as this remedy is not a specific in the venereal disease, as it has no effect on any other venereal complaints but those of the bones, I should suppose that those cases where this remedy has been so successful have been rather scrofulous than venereal.

In *suppurative inflammation* of bones, there is no visible difference between this and that of the soft parts; it does not, indeed, take place so often in bones as in the other parts, the inflammation not so often reaching so far. Whether this proceeds from an indolent disposition stamped on them from the first, or is a consequence of their structure merely, I do not know; but whenever suppuration happens in them it is a very serious piece of business. The surrounding parts, periosteum, &c. will more frequently suppurate than the bone itself. A consequence of suppuration is ulceration; but this may be also produced by blood or matter lying on the bone. There is, I believe, no difference between the ulceration of soft parts and of bones, the adhesive going on with the suppurative in the soft parts; so in the bone we have the ossific going on with the suppurative. To repair the loss made in the bone by the ulceration, Nature sets herself to work as she does to repair loss in the soft parts, by granulations: by these the loss is repaired which is made by abscesses; by which bones are united, and holes made by the trepan are filled up. (?) Nature sets about to repair the injuries of bones by the same original principles by which the bone was first formed; thus; if a cylindrical bone is to be restored, which was originally formed on cartilage, so the first step to its restoration will be the formation of a cartilage; and in a flat bone, which was originally membrane, a membrane will be first formed. But we sometimes have this ossifying process carried on so far as to become inconvenient, and existing to the degree of a disease. A difference is observable in the newly-formed substance which is formed by the ossific inflammation and that which is formed from granulations in consequence of ulceration; the former has a smooth fibrous surface, at least it is very different from the latter, the surface of which is of a granulated appearance, as if the bone had grown from the centre to the circumference, the grain of which is of a sandy texture. These appearances depend on the granulations on which the calcareous earth is deposited. In the original formation of the skull, the dura mater and the membrane which afterwards becomes the periosteum, are close together, but are separated by the deposition of calcareous matter between them, by which

the bone is formed: in the restoration of these bones, membrane is formed between the layers of which the calcareous earth is deposited. In compound fractures, the first and second mode of union is lost; and the third, or that by granulations, takes place; these form between the bones, and take on the ossific disposition. This ossific disposition sometimes extends so far into the surrounding parts, as to make the callus sometimes very large. There are no bounds to the mischief done by a compound fracture: the loss of the uniting substance by the wound, and the loss of the living principle to what remains, by its exposure, are causes of the failure of the first process; and, besides, the ends of the broken bones are sometimes denuded of their investing membrane, by which so much of the bone is deprived of its living principle, and will require exfoliation, for the dead part of the bone must be thrown off before the wound can heal. In the treatment of a compound fracture, it is to be observed that great inflammation may be expected to result from the accident: the motion of the parts must in the beginning add much to this inflammation, nor can this easily be avoided in the dressing of the wound. I would lay the limb in a fold or two of cloth well wetted with Goulard water or solution of sacch. sat., and, after applying a proper dressing, I would wrap the whole limb in this cloth, which should be kept constantly wetted. This cloth need not be renewed until the end of a week, when the leg may be fixed; but this will not always prevent motion of the leg, especially when the wound is in the back of it.

The time of union in a compound fracture is necessarily, from the processes it has to go through, much longer than that of a simple fracture; but the union of the bones is generally performed before the wound is healed: still the uniting matter is yet but soft, and therefore the fracture is now nearly in the same state with a simple fracture. There is sometimes, in compound fractures, a deficiency of the ossifying matter, but seldom, I believe, a want of the granulations. In wounds of the capsular ligament endeavours should be made at the first to unite them, if possible, by the first intention: if this cannot be done, suppuration must be allowed to come on, or amputation may be necessary. It sometimes happens, in a compound fracture, that the bone is split down into the joint, so that we have, in this case, a wound of the joint and a compound fracture. If it is such as is not likely to recover—if the laceration of the limb is such as is likely to bring on inflammation and suppuration of the whole joint—amputation will most probably be necessary; but in these cases it will be requisite to consider the laceration and the fracture abstractedly, and to determine how far they each demand amputation.

FRACTURES OF BONES FORMING PART OF THE JOINTS.

Fractured Patella.—The extension of the leg on the thigh and the flexion of the thigh on the body is capable of being effected by the rectus muscle, which is inserted into the patella; and by the contraction of this muscle it is that the upper end of the patella is drawn up; for, as has been just observed, when the leg is extended in a line with the thigh, still one-third of the contraction of the muscle remains for the flexing the thigh

on the body. Where the ends of the fractured bones are pretty soon brought tolerably close together, I can conceive that union may take place as in simple fracture. Before the year 1750, it was the practice to endeavour to bring the broken ends of the bones as near together as possible, with little or no motion allowed; but after that a fashion arose (for we have fashions in surgery, as in every thing else, arising perhaps from some person happening to do well who had not been treated in the old way) of letting the parts separate, and not so strictly forbidding motion; but now caprice has, I believe, had its day, and we are taught by reason and experience that the parts should be, when cured, as nearly as possible in their natural situation. To effect this, the upper fractured piece should be brought down by pressure of the hand along the rectus, which is to be retained in that situation by the proper application of bandage, and by keeping the leg in a line with the thigh; this to be done until a union is effected, about the end of three weeks, when a little motion is to be made with the joint; but this must be passive motion, by which I mean, motion produced by external power, and not at all by the muscles of the part. By motion the modelling absorption will be set to work. The union will be effected, as in other cases of simple fracture, from the exudation of the coagulable lymph from the sides of the skin and the ends of the bones, which is, when close, converted into bone. But observe a curious fact, when the bones are so far apart that the uniting matter is required to be of some length, then it is not bony but ligamentous, whereby it adapts itself best to the form of the joint. When the patient begins to attempt to walk about, what you have to guard against is any accident, as a fall, &c. Nothing is to be feared from a voluntary exertion of the muscles; for notice is given to the mind of the weakness of the part, and the exertions are always in proportion, therefore, to the weakness. The ligamentous union is generally latest in forming, owing to the quantity requisite from the distance; but in these cases, where the ligamentous union is produced, the patient is longer before he recovers the use of the leg, and that from another cause: for where the distance is considerable, the ends of the muscles are brought so much nearer, as when, in their state of relaxation, to be as near as they were wont to be when in their state of contraction: what was their greatest point of contraction is now their greatest point of relaxation. When the distance is not very considerable, little difficulty occurs; and this, perhaps, for the reason, that muscles possess a greater power of contraction than that requisite to the mere extending or flexing the limb; for when they have performed what seems to be their action, they yet possess contraction enough to keep the limb firm in that position: this contraction is called into action to make up the deficiency produced by a little separation of the fractured pieces. But even where the distance is considerable, we are not entirely to despair; for nature kindly effects a remarkable change in these shortened muscles.

Case.—I called with a friend to pass a day or two with a family in the country, and found that the mistress had fractured her patella about four years before, since which time she had had no use of her leg, being obliged to be wheeled about in a chair: the fractured pieces were four inches separate. I desired her ladyship to sit on the end of a dining-table, and, as the leg hung down, to endeavour to push the toes forward; but this

she could not effect in the least. I now considered that the quantity of power of contraction which the muscles in general possess, beyond that necessary for the mere purpose of extending and flexing the limb, as mentioned above, is probably obtained by the mind's influence exerted on the muscles; and that in this case, if the influence of the mind was frequently exerted on this muscle, it would gain this power of contraction, in which it would probably be aided by the interstitial absorption taking place, and actually shortening the muscle and adapting its length to the office it was required to perform. To obtain this, I desired her ladyship to repeat the exercise I had taught her as often as she could every day for a month, assuring her that, if at the end of a month she had obtained the least power of motion, I had not a doubt but that she would be again enabled to walk by a regular exercise of the muscle. The event proved as fortunate as I could wish; the lady, at the end of three or four months, being able to walk, although she had not walked for four years.

Fracture of the Olecranon.—The treatment should be exactly similar to that of the patella: the broken pieces should be brought close together, the arm extended, and kept so; and the upper piece of the olecranon brought down, if drawn up, and kept down by a proper bandage: but when union begins to take place, passive motion of the joint should be used, to prevent a stiff joint: this should be done very cautiously, and not too soon, lest the uniting matter, yet soft, yield, by which the olecranon gets bent. In simple fractures of the ancle bones, care must be had to keep them in their proper places by bandages, &c.

SUPPURATIVE INFLAMMATION OF BONES.

This may happen, first, on the surface of the bone, between that and the periosteum, having perhaps begun in the periosteum; secondly, in the solid substance of the bone; thirdly, in the medullary substance of the bone; and, fourthly, on the joints of bones.

Of that on the surface. Here, as in the soft parts, the abscess is bordered by additional substance, the ossific or adhesive inflammation forming a circle of adventitious bone; in this the periosteum separates, and the matter is contained between it and the bone: as soon as ever the existence of the matter can be ascertained, it should be directly laid open, and that with the utmost freedom: where bones have often suffered thus, they get considerably thickened.

The second case, where the abscess is formed in the solid substance of the bone, is of much more consequence than the former; in the former case the bone is only thickened on its outside, where the abscess formed; but in this it is thickened quite through. Suppuration of bone does not go on so fast as in other parts; but whether this is from an indolence natural to bone, or from the parts not giving way so fast, I do not know, yet suppose it may be from both. It is curious to observe how busily nature has been employed on these bones, in laying on adventitious bone externally, while by the disease it is removing it internally: this is done by the periosteum and surface of the bone being possessed by the ossific inflammation whilst suppuration is going on within.

The third situation, in the medullary canal. Here the ossific inflammation seizes the medullary canal at the ends of the abscess, by which it is prevented from extending through the whole of the canal; and here, as in the former case, bony matter is laying on the outside whilst removing from the inside. It may not be improper in this place to notice a curious fact, that this chiefly happens, and in the greatest degree, where strength is most required, as in bones of the lower extremity, little of this bony matter being formed on the skull in cases of its inflammation. In some cases nature even is obliged to take up this newly formed bone, where, by removing from within and adding without, bone is removed from far beyond where the original bone reached.

We have sometimes exfoliations in these two last cases, but not so often as in the first. The head of the tibia is more subject to abscesses than any other bone of the body, and which often require, for the discharge of the matter, that an opening be made with the trepan; and both in this and in all the other situations, it may be proper not only to make a simple incision, but to remove the soft parts over the diseased bone, and sometimes destroy the life of the bone itself by the actual cautery. Oil, as oil, can neither retard nor quicken granulation. The newly formed substance, from its weakness, is very likely to be taken up. Matter from diseased bones and some other ulcers discolours and perhaps corrodes silver. Mr. Kirwan has proved, that the hepatic air from putrid animal substances has this property. Joints of animals are not true and exact mechanical joints, but allow great latitude of motion, moving on several centres. By this greater motion, and with fewer joints, is obtained. The bones are kept firm in most joints by the action of their muscles; as we see, by dissecting away the muscles, how weak the connexion of the joint then is. Weak joints, as they are in general called, are rather weaknesses of the muscles.

OF THE SHORTENING OF MUSCLES OF DISEASED JOINTS.

Joints when diseased naturally get into a middle state between flexion and extension; and as the joints are passive, this must be performed by the muscles, and either by their voluntary or involuntary action. This stiffness of the joint depends on the involuntary contraction of the muscles, and is in consequence of the muscles sympathizing with the joint; but this involuntary contraction is not like that of tetanus: the muscles in this state feel like strong cords, and, if straightening the joint is attempted, it seems to the patient as if these cords were breaking. As the joint loses its power of motion by the disease, in that proportion the muscles are altered; they adapting themselves to the quantity of motion which the joint will admit.

SPRAINS.

When external force is laterally applied, the joint gives way as far as the ligament allows, which is often broken on that side on which the joint is most stretched. This, I

am led to think, is the case, from the quantity of extravasated blood, which I think is from the rupture of the ligament. Swelling takes place directly, and this from distention of the cellular membrane, and perhaps from increase of the synovia. In these cases, rest, and bleeding the part with leeches, may be used. Fomentation with vinegar, and the application of cold water and camphorated spirits, have been recommended; but the effects of these I know not. As to putting the foot in cold water, I conceive that, where the injury has been some time inflicted, holding the part a considerable time in cold water is an improper mode of application: the only proper mode of applying it in this case is by immersing it quickly in the water, so as to bring on heat in the part after taking it out. In the first stage, indeed, holding the part in the water longer may be more proper.

DISLOCATIONS.

I THINK that in general the ligaments are torn in dislocations; but this point is not yet ascertained. I once saw an instance of dislocation, where the head of the tibia had got so far under the femur, that the line of action of the muscles passed nearly through the centre of motion; in consequence of which the head of the tibia was only drawn up against the femur, without any motion. I pulled the head of the tibia forcibly forwards, when the extensor muscles immediately drew it properly into the socket. In the reduction of dislocations we must recollect that the looser part is to be acted on by our exertions, whilst the most fixed part is to be the reacting power. Now our power will be lost if this opposing power is not fixed: this is very difficultly obtained in attempts at reduction of the dislocation of the humerus, where the scapula should be made a fixed point. When we pull the os humeri, the scapula is also pulled along with it, and our force is spent on the joint of the scapula and clavicle, and on the latissimus dorsi and pectoralis muscles, which pass from the trunk to the os humeri, as well as on the muscles connecting the scapula to the trunk: our endeavours should therefore be, as much as possible, to render the scapula a fixed point The bone should be returned exactly in a retrograde motion, overcoming that effect first which was last produced; thus, that position in which the head of the bone is placed by the action of the muscles must be first altered, then that which was the effect of the lateral force applied. When a joint cannot be reduced, we sometimes have a new joint formed where the head of the bone is lodged. This must, in general, be where the dislocated head of the bone lies on bone, on which it can be moved; and here a kind of socket is formed by the ossific or adhesive inflammation changing the soft parts until cartilage, and something similar to synovia, is formed. This is most generally found to have taken place in dislocations of the femur: it may be also produced when the os humeri lies against the scapula.

OF THE EFFECTS OF ACCIDENTS AND INFLAMMATIONS ON JOINTS.

These are to be considered as circumscribed cavities, and liable to the diseases of the other circumscribed cavities; but from some peculiarity they seem, perhaps, more likely to run into diseased actions than other cavities, this arising from the materials of which they are composed, and the violences they are likely to receive: they seem also more subject to be affected by specific diseases. When inflammation is in consequence of a strain, it generally does well. In inflammation of the joints there is a swelling, and this from the distention of the adipose and cellular membrane. When this inflammation is in consequence of accident, rest, and bleeding the part with leeches, is very proper, as well as fomentations, &c. Blistering the joint may, perhaps, be also proper; but as diseases of these parts are so likely to run into scrofulous action, we should send them to the sea, if the disease appears to be stationary.

EXTRAVASATION OF BLOOD INTO JOINTS.

Loose pieces of cartilage, which are occasionally found in the joint of the knee, the presence of which has been hitherto unexplained, I suppose to arise from extravasated blood from injury becoming vascular and growing to the ligament or cartilage, and taking on their nature, in the same manner as the extravasated blood which I shewed to have become vascular on the testicle. This I suppose to have been loosened from its attachment, which is slight, and to have got loose into the joint, and floating in the cavity. This preparation gives a proof of the correctness of this idea: it was found adhering to the peritoneum lining the fore part of the abdomen, and was a solid globular vascular body, connected by a slight pedicle to the peritoneum. Now it is only to suppose the same production in the cavity of the joint, and the disease is accounted for. This was found loose in the belly of a lion: this from the belly of a bullock. They are not, indeed, so often found in any other joint as that of the knee; but this perhaps may proceed from no other joint being so liable to such injury as to produce them; but still more, perhaps, from no other joint being so formed as to be so likely to have such effects produced as shall shew their existence. For their removal, the piece should be pinched up and held very firm by an assistant, whilst the incision is made, which must be on the inside of the upper end of the patella, and about an inch from it: great care must be taken that the piece does not escape whilst the incision is making. The incision must, if possible, be healed by the first intention; to do which the lips of the wound must be brought exactly together, and confined with sticking-plaister, and a bolster on each side of it, over all the uniting bandage, keeping the limb quiet and extended.

ANCHYLOSIS

Is the uniting of bones together which ought not to be so ; and this may be either by a bony or a soft union. The joint may be looked on as a secreting surface, and must, therefore, undergo great change before adhesion takes place, which may occur either from the adhesive inflammation, or from granulation. The soft anchylosis is supposed to be where there was no intermediate soft substance before.

The bony anchylosis is of five kinds, four of which are the consequences of the ossific inflammation ; but in the fifth, it is the consequence of the formation of an entirely new substance. Bones may be anchylosed at other parts besides their joints ; thus we have here two ribs, ulna and radius, tibia and fibula joined together laterally, but they most commonly anchylose at the joint : of this last there are two kinds, the one where, as in the vertebræ, there is an intermediate soft substance ; the other, where it is a complete joint with a surrounding capsular ligament. The anchylosis may be, first, by means of the connecting substance uniting the ends of the two bones together into one continued piece ; secondly, the anchylosis may be effected by the continuing on of adventitious bone from the surface of one bone to the other, so that the bones are fixed together, though their ends are not united. One cause of this may be the ossific inflammation having seized the periosteum, as in the vertebræ ; here they are fixed together by this external matter, but are at their proper joints as much apart from each other as is natural, the intervertebral substance not being ossified. Thirdly, anchylosis between bone and bone, by a continuity of substance, as in the ossification of the intervertebral substance ; fourthly, by means of the capsular ligament taking on the ossific inflammation ; this is worse than the former, because, where there is this capsular ligament, there is generally more motion required, the mischief being in proportion to the previous use of the joint : fifthly, where the whole articular cavity is filled with a soft substance, the cartilages having become pulpy, this soft substance remaining takes on the ossific disposition, and becomes bone. The soft anchylosis arises from the cavity of the joints being filled with granulations, the consequence of previous suppuration, which afterwards become ossified : this is exactly what takes place in the union of a compound fracture.

SUPPURATION OF JOINTS.

This may be the consequence of pure inflammation, or most commonly, I believe, mixed with scrofula. We have here the suppurative rather than the adhesive only ; as by suppuration there may be a somewhat greater chance of motion being left than if adhesions were formed. These, like other abscesses, make to the external surface ; but the ulcerative process is always slow here in bringing the matter to the skin. The ulcerative inflammation attacks the ends of the bones, and sometimes so much so as to alter their form, the consequences being very uncertain : they frequently become scrofulous.

By opening these abscesses, such an inflammation comes on as threatens the life of the patient so much, that amputation would have been preferable at first, hectic generally succeeding. It sometimes happens, after the suppurative inflammation, that some motion of the joint will be preserved, and in some cases, I believe, the cartilage of the joint is recovered. Where this does not happen, the muscles which act on that joint become wasted and weak. This, I suppose, must be from sympathy, from a consciousness, as it were, of the incapacity of the joint for motion, in consequence of which they adapt themselves to the quantity of motion which these joints will admit; and this takes place equally with all the muscles of that joint, though the failure be of one tendon only. Thus it is with a work of art, the powers will always be in proportion to the action which can be produced.

Disease in a part may produce effects in a part beyond it. When the diseased part is between the heart and the last affected part, the effects produced are debility, anasarca, inflammation, suppuration, and mortification. Thus, in a disease of the back or loins we shall find some of these consequences follow in the lower extremity; and here it may also be observed of the contraction of muscles in diseased joints just mentioned; both these may occur together, as is often the case with white swellings of the knee. But these are very different from one another, the contraction proceeding from an endeavour in the muscles to adapt themselves to the state of the joint; whilst this last set of symptoms are more like symptoms of the dissolution of the part: these last are, perhaps, reducible to a kind of sympathy, such as when constitutional is produced by local, as hectic from a local affection, so these symptoms seem to be hectic of that part. The part wastes, then becomes œdematous, inflames, and even suppurates or mortifies: it is, in fact, a local hectic.

EXFOLIATION OF BONE.

By this I mean the separation of a dead piece of bone from the living. This appears to me to have been, and still to be, as little understood by the best writers in surgery as any part of that science. Caries has, in general, been the term by which every alteration of the bone has been called; some, indeed, have said that the parts underneath were not idle, and that the scale of dead bone was pushed off by a fungus underneath it; but the manner in which the separation of the dead piece is effected has not yet been explained: it is not performed by a rotting of the bone, as has been said. Bone is composed of true animal matter and of calcareous earth. In the hard bones there is more of this earth and fewer vessels than in the softer bones. When a piece of bone loses its living principle, it adheres only by its attraction of cohesion; therefore nature has to destroy this attraction, and then get rid of the dead piece as it would any other extraneous body. To effect this, the living adjacent bone becomes inflamed and more vascular: whether more vessels are formed, or whether the old ones only are enlarged, I know not; it is sufficient that injection proves the part to be more vascular. The periosteum and cellular substance also inflame and take on the ossific disposition, and

this to a considerable extent. The first step which nature takes is to absorb the earth from all that surface of the living bone which is next to the dead piece, so that surface of the living bone becomes as soft as if it had been steeped in an acid, by which process also bone is deprived of its earth; but the dead piece remains as hard as ever. Still the piece is connected to the living bone by the animal part remaining; for as in this piece of thigh bone, which has been steeped in an acid, there is yet a strong adhesion by the animal matter between that part and the part possessing its natural quantity of earth, the absorbents, therefore, continue their work until this connecting animal substance is also absorbed, and a line of separation takes place between the dead and living part. This separation does not take place over the whole surface at once, but begins at the circumference, and proceeds on to the centre, so that the middle might be only going through the first stage of this process, whilst, perhaps, the separation is complete at the circumference; hence appears the reason why exfoliation is so tedious a process. In every broad exfoliation we may find nature at work at the circumference, forming granulations before separation takes place at the centre; but when, in consequence of the connecting part being absorbed, the whole piece is loosened, it is then got rid of as would be the case with any other extraneous body, being pushed off by the rising up of the granulations underneath. Now, you observe that in all these pieces of bone, the dead piece, or that which is about to be exfoliated, has the same smooth surface it had when living; but the surrounding living part, you see, is much less solid, being spongy, owing to the cavities made, and the numerous and increased bloodvessels. It often, nay generally, happens that the granulations from the surrounding soft parts cover a great part of this dead or exfoliating piece of bone; and it often happens that the piece is locked in by these granulations becoming ossified: thus, whilst nature is busied in getting rid of that part of the bone which is dead, she is laying on additional bone on the outside, the intention of which seems to be that of keeping up the strength of the bone, which would, without this addition, be lessened by the loss of substance. This opinion is, I think, supported by this circumstance seldom occurring, in this manner, in any of the bones but those of the lower extremity, which support the animal. If this is true, it is a curious process by which nature endeavours to support the strength of these bones during a loss of substance, by throwing on the outside bone in proportion to the loss of substance. Nor is the process less curious by which this adventitious bone is afterwards removed, and the piece of dead bone, which was locked in, is set at liberty; for from all that surface of the living bone which is adjacent to the exfoliating or dead piece, granulations arise, which push up the loose piece against the upper sides of the cavity, and, in consequence of this pressure against the newly formed bone, the absorbents are set to work to remove it, and in proportion as this is absorbed the piece is pushed up by the granulations underneath it, until, by the action of the absorbents in thus modelling the new bone, and the action of the granulations underneath, which press up the piece, it is at last pushed out, when by the continuation of these granulations, and their ossification, the defect in the bone is made up. That, in the separation of the dead piece, a part is absorbed, I think is very evident; and that there is a loss of substance at the

line of separation is obvious from this circumstance, that if, after a circular piece is taken out of the skull, the circular edge of the remaining bone has its life destroyed, by the actual cautery, to any distance, this deadened part will separate and come away, which it might not be able to do without a loss of substance between the living and dead bone. Another proof of the loss of substance occurs also in this supposed case, for the side of the circular piece which is separated will retain its spiculæ, whilst the surface of the edges of the remaining bone, so far from corresponding, is quite smooth. Now, as there is room in this circular hole to allow the ring of bone to come out, its regularity cannot be the effect of new matter added between its spiculæ, but is in consequence of its absorbing these spiculæ. It appears, from this last supposed case, that it is my opinion that the absorption is of the surface of the living bone; but I by no means wish to be understood that no absorption of the dead piece can take place; for, on the contrary, I believe that nature sometimes finds it necessary to the completion of her process: it generally takes place when the separation is slow and the granulating process is quick. This absorption of the dead bone takes place in the fangs of the shedding teeth. At the commencement of the exfoliation, the surrounding healthy bone begins to look irregular and spongy all round the dead piece, which still remains as hard as ever, and retains as smooth a surface, except when its substance has been corroded by disease. After the piece is thrown out, the granulations become semi-bony, and are at last quite turned into bone. Hard bones exfoliate more readily than the softer bones, and the harder parts of the soft bones: the bones of full grown people sooner than those of younger. This is, perhaps, owing to the former becoming sooner dead than a softer one, the soft possessing more vessels. This process is sooner gone through in proportion to their situation as to nearness to the source of circulation. The pulsation of the matter lying in a hole over the part where this process is going on, I account for, by supposing that the impulse from all the subjacent granulations centre in this hole containing the matter, as the motion of the mercury would be invisible in the bulb of the thermometer, but is evident in the thread of it.

Exfoliation from accident done to sound bone, and that sufficient to kill the part receiving the force applied, may be either from a cylindrical bone or from a flat bone, such as a bone of the skull, and is very likely to happen from gunshot wounds. At the ends of bones it also occurs after amputation, and this in consequence of death of the part from the action of the saw; in fact, it may be the consequence of any mechanical force, if applied with sufficient power; as also the consequence of death being induced in a part by the potential or actual cautery, as is often done for the cure of a diseased or carious bone. This practice of cauterizing diseased bones arose from the idea, that all diseased bones were disposed to exfoliate, or in the act of exfoliation; but that this took place slowly, and that, by the application of the caustic, this process was hastened: the fact is, that exfoliation is not, as has been supposed, a necessary consequence of disease in a bone; but it is the death of the piece of bone which renders its exfoliation necessary. Now caustics do not hasten the process of exfoliation in this case, but, by effecting the death of the part, produce the first step to exfoliation. Indeed, as far as the actual cau-

tery excites inflammation in the surrounding parts, so far something is done towards the exfoliating process. Judgment should be made of the extent of the disease, and then in proportion to that should be the heat of the iron and the extent of its application. When the bone is thus cauterized, it may be observed that its destroying power extending to the neighbouring parts is of much less consequence than leaving any of the diseased bone undestroyed. Exfoliations may be either external or internal, and even the external may be inclosed. The external always arise from the external surface of the bone; the first situation of the suppuration of bone may produce the external exfoliations. The internal exfoliations may arise from the two last situations of the suppurations of bones; the matter makes its exit through them by the process of ulceration, the exfoliated piece by its pressure hastening this absorbing process: by this process going on, the quantity of original bone is lessened; but this is made up for by the adhesive ossific inflammation, which lays on bone externally as it is absorbed within. Thus, when a portion of the external surface of a bone becomes exfoliated and encased, it may appear to be an internal exfoliation; and the same remark may be made respecting an exfoliation of the whole substance of a bone, when encased. Besides the external and internal exfoliations, we may have exfoliation of the whole bone, which may become encased. In the first of these, where the external appears to be internal, we may observe, that before the total separation of the piece of bone has taken place, its edges become covered by the adventitious bone, which continuing to spread over the piece, at last almost covers it, leaving a little hole only for the discharge of the matter; this circumstance chiefly occurs in the lower extremity: the mode in which this piece is afterwards extricated, and nature's economy in this process, has been already shewn. In the second, where a piece of the whole substance is removed; here the separation takes place at the two surfaces, in contact with the two ends of the dead piece: this piece becomes enclosed by the joint effects of the adhesive ossific inflammation and of the granulations, the inner surface of these granulations forming the case absorbing the dead bone when they are in contact, to get rid of it. The third, or where the whole bone becomes enclosed in a case, in consequence of the ossific disposition taking place in the surrounding soft parts. It is difficult to say how this is effected at the ends of the bone; but I should suppose that the ossification here proceeds from the coagulable lymph thrown out by the ends of the bone, or by that which is thrown out by the ligaments of the joint; however it be accomplished, the joint is sometimes, in these cases, preserved. The extraction of these exfoliations is difficult, from not being always able to ascertain their situation.

Case.—A young gentleman applied to me with a disease of the os humeri. I examined, and found by the probe a loose piece of bone, contained in a bony case: suspecting it to be of the second kind, I made an incision on the outside of the biceps muscle, and laid the bony case bare; and then with a saw and chisel laid it open, and by the aid of larger and larger wedges, in two or three days I was able to extract the inner piece, which was almost of the whole os humeri in thickness, and half so in length.

RICKETS.

The defects in bones may proceed from a constitutional affection, or a deficiency in the bone itself. It is generally accompanied with weakness; but weakness alone is not the cause of this disease, for with that we must have joined a disposition; therefore to constitute this disease there appears to be required a general weakness, with a peculiar disposition. This peculiar disposition I here suppose to be the scrofulous disposition; and I imagine one effect of scrofula is the absorption of the calcareous earth from bones, by which they become softer, larger at the ends, and curved, from their not being able to support the weight, the bones being defective in the quantity of calcareous earth, and in some measure of animal matter. The rickets generally affect young persons: the excessive size of the ends of the bones I suppose may arise from the growth of the animal part going to excess, from its not being checked by the due admixture of the calcareous earth; this effect taking place most generally in those bones which are naturally soft, as well as in the softer parts of hard bones. That there is this want of proportion between the calcareous earth and animal matter you will have made sensible to you in the examination of these bones [several ricketty bones shewn, which were astonishingly light]. Wherever bones are enlarged, they become softer. The increase of size in ricketty bones I have just endeavoured to account for; but I must add, that this increase seems only to take place whilst the parts possess their powers of growth, so that a grown person may have the rickets without any swelling of the bone attending it. This disease seems, in children, to be the consequence of a disposition not to deposit calcareous earth, and, in the adult, of a disposition to absorb it; though it must be allowed, as we know of the calcareous earth being constantly changing, there may be here also a deficiency in its deposition. This disease (disproportion between the earth and animal matter) is sometimes carried much farther in adults than in children; for in the latter there is generally some calcareous earth found in the bones, whereas the bones of the former become sometimes quite flexible. The bones which sustain the body do not effect this exactly in a perpendicular direction; hence, if there is a disproportion in the materials of their composition, they will give out at the joint, according to which side of the centre of gravity the pressure is chiefly made. From the weight of the body and the action of the muscles, we also find the bones are bent in ricketty patients. The cure of this disease is not yet known: all that we at present can do is to give strength, by bark, sea-bathing, exercise, &c. Sea-bathing seems, in my opinion, to do rather more than merely giving strength; but the specific cure of this disease is not yet known.

EXOSTOSIS AND MONSTROSITY.

Exostoses sometimes arise suddenly, but in general slowly; sometimes growing to a very great thickness, which shews that they have a power of growth in themselves.

They generally appear near the ends of the bones. They are not adventitious bone laid on the other, but growing out of it.

Sometimes from monstrosity the formation of the joint is varied, and the action of the muscles disturbed, and of course the motion affected. Two children I knew were affected with swellings of the bones in different parts of the body, some disappearing whilst others were returning, accompanied with considerable pain, which were relieved by sea-bathing. The boy has one now on the os humeri, nearly as big as a child's head. As these are so connected with the natural formation of the bone, there is not so great a likelihood of their being removed by absorption, as if they were a consequence of disease. Where their absorption cannot be effected, they may be removed (their situation being first well ascertained) by the proper use of chisels, saws, &c.

CARTILAGE

Is a particular animal substance, which seems to be in consistence between bone and the soft part, and appears, of all other animal substances, the nearest to horn. It answers two obvious purposes,—a substitute for bone, and a nidus for bone. Cartilages are divisible into two kinds; the first are those which are of use in the animal economy, when the animal is at its full growth, and which, therefore, are permanent as cartilage: such are the cartilages of the joints. The other are those which sometimes take on a change of their substance, becoming bone, such as the cartilages of the ribs and of the larynx. The natural cure of these parts, when injured, exemplifies this difference; for if one of the first class is fractured, the union is formed by cartilage; if of those which are disposed to change into bone, the union is by bony matter. Bone in these is also formed by their inflammation. They do not suppurate: suppuration may appear to be produced in them, but it is of the parts surrounding them. They seem to possess in themselves so little powers of action, that, I believe, they do not admit of the ulcerative process from the action of their own absorbents; for though, in cartilages of the joints, there appears sometimes to be ulcerations, yet this seems to be the effect of the action of the absorbents of the surrounding parts, where they come in contact with it. In this cartilage, being that of the lower end of the os femoris, you may observe the processes by which nature acts, for here you may see it has been absorbed by the absorbents of the bone; and here, you see, suppuration taking place, and the cartilage peeling off, the surface next the bone appearing as if it had been eaten. The cartilages, by exposure, become softer; the same as they do in inflammation of the joint, without exposure: this must be in consequence of absorption.

Case 1.—A girl's finger was amputated in the joint, and a few days after the cartilage came away.

Case 2.—A woman had her arm amputated at the shoulder joint, with a flap, by Mr. Bromfield; and in two years afterwards, she died of a fever in St. George's Hospital.

Upon examination, I found that the cartilage had not adhered to the flap, which in that part had a smooth surface; nor had any granulations arisen from the cartilage, which appeared unaltered. The powers of the cartilages do not seem to be sufficient to allow them to go beyond the adhesive inflammation. Although they can neither be classed positively with the soft nor the hard substances, yet they have been said to exfoliate: but I cannot say that I ever saw any sensible exfoliation of a cartilage; for though I have seen separations from the cartilages of the larynx and ribs, they have been ossifications, and therefore are exfoliations of bone, not of cartilage: and, again, I have seen a separation of cartilage from the end of a joint; but then it has had a surface of bone with it, and was therefore an exfoliation of bone from bone, not of cartilage from cartilage.

HÆMORRHAGE.

Discharge of blood may be natural, or it may arise from disease or accident. Of the first kind is the menstrual discharge; of the second, are discharges of blood from the nose, lungs, intestines, piles, excessive menstruation, &c. These may be local or constitutional; but the local are more to our present purpose: the causes may be either a peculiar irritation, or a species of relaxation in the vessels of the part. With respect to bleeding from the first cause, that is not a very infrequent circumstance, the vessels of the part being affected by some particular irritation: bleeding from this cause I have frequently seen upon the action of a new stimulus; thus, I have noticed, after many operations, when the bleeding had stopped by the natural contraction of the arteries, that they have opened again upon the application of the actual cautery in their neighbourhood. A discharge of blood from this cause will sometimes happen from surfaces, which otherwise might have been expected to discharge pus. In these cases, instead of the application of styptics, as they are called, sedatives should be applied: the best of these are, perhaps, opium, and the different preparations of lead. I was called to a sore, which was discharging great quantities of blood; but this was stopped by a poultice of poppy-heads. The loss of no fluid has such effects on the system as that of the blood, producing faintings, coldness, cold sweats, &c. Where the loss has been considerable, the absence of the pulse, and extreme coldness, shew the patient to be near the last extremity, and death, indeed, would most probably be the consequence of any farther loss of blood; but it generally happens that these alarming symptoms immediately following the bleeding are succeeded by a feverish heat, with a quick strong pulse; and here it has been considered whether bleeding is not necessary to prevent a return of the disease: but it is my opinion, that this rising of the pulse and return of heat are in consequence of a struggle of nature from the loss she has sustained, as if calling up every power. Secondly, Hæmorrhages from relaxation, or want of disposition to contract, may happen from external force applied, or from disease. The mouths of the vessels may be stopped; first, by the natural muscular contraction of the cut edges of the vessel, the stimulus from the

accident producing this contraction, so that, in this case, the cure arises out of the accident. I do not think, if the arteries below the knee were divided by amputation, that the patient would be killed before the natural contraction of the arteries took place. The bleeding was stopped by the natural contraction of the artery in a boar whose thigh was amputated; and in an ass who had bled to the death from these arteries, the artery was, after death, found closely contracted; but I believe the arteries of quadrupeds to be more contractile than ours. This contraction is the consequence of the stimulus from exposure and division. Leeches make wounds, for their size, the most difficult to stop of any: this has been said to have been from their taking a piece out of the side of the vessel: if this were all, the contraction of the vessel would be sufficient to stop the bleeding; but I am more inclined to think that the leech poisons the vessel, in consequence of which its contractility is destroyed. Oil of turpentine is, perhaps, one of the best styptics: it should be applied to the wound, the wound being first wiped clean, and the bleeding checked by pressure, that it may be fairly applied. I have given it often, with great success, internally, when other things had failed. A gentleman who had had repeated bleedings at his nose, until he appeared like a corpse, sent for me upon a return of his bleeding. I ordered him a draught every two or three hours, with ten drops of oil of turpentine made up with yolk of egg: this stopped the bleeding, and he has continued well ever since; for whenever there is the least disposition to a return of the bleeding, he takes a draught, which he says prevents it. Another mode by which bleeding is stopped is, by pressure of the coagulated blood round the mouth of the vessel; this is chiefly effectual where the orifice is not very large; acting by pressure it is aided by spongy substances being applied, as lint, agaric, &c.

The lateral wounds of arteries are commonly, though improperly, termed false aneurisms; and this has probably originated from a pulsation being felt in them, it having been supposed that only the external coat of the artery had been wounded, and that the internal had given way at this place, having lost the support of its external coat: but the fact is, that the blood escapes into the cellular membrane, and, assisting the external pressure, may retard the bleeding; and where speedy dressings are applied, the bleeding may, for the present, be stopped; nay, the external wound be healed by the first intention; but by the constant and increasing pressure, the surrounding cellular membrane, that contains the extravasated blood, by degrees gives way, and forms a perfect cyst. These may be divided into two stages; first, whilst the case is yet recent; secondly, where this cyst is formed. The artery should be taken up before this cyst is formed.

Case.—A young man wounded himself in the thigh; both the crural vein and artery were obliged to be taken up. I would in cases of wounded artery, in bleeding, give a chance to the artery of healing, by speedy dressing, pressure, &c. I made a small puncture in the crural artery of a dog, which healed, and no aneurism was formed.

ANEURISM.

The really true aneurism, proceeding from a dilatation of the artery, only deserves the name of aneurism, and is not divisible into different species. I conceive there may be a previous disease in that part of the artery, which will allow of this dilatation, and that it is not to be attributed to the circulating force as a first power. The following experiment shews the little probability there is of an aneurism arising in consequence of injury done to the external coat of an artery, whilst the internal is left entire, which has been set down as one species of aneurism, the internal being supposed to be dilated through the opening in the external.

Experiment.—I dissected the carotid artery of a dog, taking off carefully the external coat, until I could almost see the blood through the internal one; I then left the dog and his artery to themselves, and at the end of three weeks killed the dog, when I found the surrounding parts had consolidated themselves to the artery, rendering it stronger in this part than it was before.

Mr. Cruickshank has, I think, in reading some books of surgery or anatomy, or his own experiments, produced an experiment in opposition to mine, where, after the artery was denuded and thinned, the parts surrounding it were kept from uniting with it, and an aneurism formed: but let the experiment come from where it will, it does not apply here; for in what instance could such an alteration be made in the artery, and the surrounding parts not unite to it? Aneurisms are generally found in the first order of arteries; but I have even discovered them in the pudica interna. The disease is always too local to depend on the force of the heart alone; there seems to be a specific disease of the artery: this being supposed, the force of the heart may produce the disease, being applied, perhaps, more to one side of the artery than the other, as at the curves of the aorta; and this part of the artery may be the part least surrounded with other parts, and may therefore be more or less affected according to these circumstances. The sac consists chiefly of condensed and thickened membranes. This is a disease, undoubtedly, which is very dangerous, but, happily, frequently capable of being removed; indeed, when increased to a considerable size, the operation is a very difficult one; but I should wish that it be performed whilst the tumour is but small, and never permitted to arrive at any considerable size. Mr. Bromfield and Mr. Pott having both written on this subject, and their opinions being different to mine, it is necessary that I should defend those opinions which I have adopted, and which I have spread abroad.

Mr. Bromfield objects to every operation in this disease, and that, in the first place, from the immediate want of success in the operation, and from its being a disease of the whole arterial system: he says, "I once saw this operation performed by a gentleman (that's me, gentlemen) upon the popliteal artery; but the difficulty of the operation, and the embarrassment which the operator underwent (me again), will, I dare say, deter him from performing it again;" but I am not so soon deterred, gentlemen. You shall be informed of the case, and then judge how far it ought to influence me as to deter-

ring me from that operation. With respect to the objection, from the disease being of the whole arterial system, unfortunately for Mr. Bromfield, and fortunately for me and for mankind, this is not always the case. With respect to Mr. Pott's observations——but we must leave Mr. Pott to another evening, for he is tougher than the other a good deal.

Mr. Pott objects to the operation, because he supposes it to be performed in such cases as, I should hope, timely operation might have prevented from arriving at that state. Mr. Pott should have considered, that there is a stage of this disease, in which his objections could have no force; why, therefore, should it be permitted to arrive at such a state as renders the operation improper? The first moment we discover an aneurism, we know what must be the event of it—that, unless removed, it will gradually enlarge, until it destroys the patient: he, therefore, who neglects to remove it in its first stage, deviates from the first principles of his profession. My opinion is, that the operation ought to be performed before the other parts are injured, especially those beyond; the aneurism being circumscribed and distinct, the pulsation also being perfect and distinct. I say it ought to be performed as soon as it is known to exist; but by some it has been recommended to permit the disease to exist some time first, because, they say, as the circulation becomes obstructed through the trunk, the collateral branches are more enlarged; but this effect cannot take place until after the obstruction has subsisted some time, by which time the operation may be improper. The arteries in which I suppose the operation is proper, are the external carotid or any of its branches; the subclavian, after it has got through the splenius muscle; the crural artery, after it has got through Poupart's ligament (how it would admit of the operation above that, I know not). The branches of all these are comprehended; but perhaps we ought not to attempt this operation on these arteries immediately upon their exit from the trunk, as we may not have latitude enough for choosing the place of tying it. I have frequently laid bare the carotid artery for a considerable length, in dissecting out tumours. Now, if I had wounded this artery, I should certainly have taken it up; and if I would do it in the one case, why should I not in the other? Thus I have found a tumour have the temporal artery so engaged in it, that, after having tied the artery above and below the tumour, I have removed part of the artery with the tumour. In the operation, where the tourniquet can be applied, that is the first business which is to be done; then an incision must be made the whole length of the tumour; then an opening into the tumour, and the coagulated blood scooped or sponged out: the two orifices into the sac from the artery must now be found; the lower will shew itself by the oozing of dark blood from its orifice (the blood becoming dark from stagnation or slow motion), the upper may be discovered by slackening the tourniquet a little. Ligatures must be applied both above and below the tumour, and between the ligatures I should recommend the artery to be slit up almost to the upper ligature, lest any anastomosing branch from the upper part of the artery should continue to fill the sac, or puzzle and embarrass the operator by the continuance of the bleeding after the artery had been tied: this will

be discovered by slitting up the artery, and may then have a ligature passed round it. If the tourniquet cannot be applied, the ligature should be passed round the artery, and tied above the aneurism, before the sac is laid open.

This is the case which Mr. Bromfield has noticed:—A man had an aneurism of the popliteal artery. I performed the operation; after which the vena saphena was observed to be full of blood, and, if emptied by pressure, directly filled again: the limb continued warm, and every thing went on well until the fifth day, when a violent hæmorrhage burst forth. I was now obliged to dilate the wound higher, and take up the artery higher; but he died a day or two afterwards. The leg and thigh were both found to be putrid and emphysematous, and that was the case even above the aneurism. When I saw this man dying from the loss of blood, it struck me as a proper case for transfusion; and if I had been in his situation, I would have had the blood of a sheep or hog, &c., transfused into my vessels. How to account for the failure of this case I know not; whether from the unsoundness of the vessel, or the tightness or the smallness of the ligature, I cannot tell; but from what had appeared before the bursting of the vessel, and from injecting the limb after death, every other circumstance seemed favourable to the operation; therefore I shall not, as Mr. B. supposes, be deterred by this case from again performing the operation. I have performed it several times, have succeeded and have failed; and have learnt by this case and others, that my error has been in taking up the artery too close to the tumour, for the sake of saving as many of the collateral and anastomosing branches as I could; but I now think very little of saving these branches; at least, I do not choose, for the sake of saving them, to take up the artery too near the tumour. I have lately performed the operation at St. George's in a manner different from the general practice. I laid the popliteal artery bare above and below the tumour, and took it up, leaving the tumour for nature to absorb, or to act with as she would: the operation has been performed above a month, has succeeded very well, and the tumour is smaller and softer than it was.

DRESSING OF WOUNDS.

Dry lint is improper as an application to recent wounds. Poultices are preferable in all wounds which must suppurate. Linseed meal poultice is better than others, and may be made with more ease, for it need only be strewed in hot water, or sprinkled with hot water. Where poultices cannot be applied, and dry lint ought not, it may be spread with some unctuous matter; and nothing is better of this kind than oil and wax. Poultices are generally made too thin; they should be of such a consistence that they may retain their form, and not have it changed merely by their gravity. When suppuration is established, then dry lint may be proper. Bringing down the skin, from our anxiety to lessen the wound, is often done at the first dressing after amputation; but this is, in my opinion, wrong, as the state of the parts is such as will not allow of it; for we are sure to have the inflammation from the operation come on, which will tend

to produce a retraction of the skin, and, being opposed by bandages, &c., the inflammation is thereby increased: we should, therefore, wait till the inflammation is subsided, when the skin will be found tractable. Where the integuments over an abscess have been thinned, and in part rendered unsound, an incision will not so readily heal, but will give the wound time to heal up from the bottom; but it may not be so where we have been obliged to open an abscess early, and make the incision through sound flesh.

The healing of abscesses and sores may be retarded by situation, as depth, nearness to tendons, bones, &c., or in the lower extremity. Fistulous sores may sometimes be cured by bringing the sides together; but before this can be effected, the discharge must be changed to a good kind, and all inflammation be removed. Retardment may also be produced by the way of life, as by intemperance, and by much walking when the leg is affected. If, when the more obvious causes of retardment are removed, the wound still remains, we may suspect its possessing some peculiar disposition, of indolence, irritability, &c., or some specific quality, as venereal. The surface of a sore over an unsound part, as carious or otherwise diseased bone, is different from that over a sound one, and very seldom heals: they, however, sometimes heal over, but then no good cuticle is produced: repeated layers of the cuticle are formed and separated, becoming a hard scurf or scab, almost similar to an elephantiasis. It makes a great difference whether an abscess is of a part or only in a part; there is a considerable variation in the treatment also, for the latter sometimes, as in a lumbar abscess shewing itself in the groin, it may be occasionally prudent not to open it, as we are sure thereby of bringing on the hectic sooner.

DISEASE.

We now begin with what I term disease. What I have hitherto treated of as the consequence of violence, or where the same salutary disposition is put on as takes place after violence done to a part, I do not call disease. Specific diseases may be local or general; the first, as chancre and cancer; the second, as small-pox, pox, &c. The irritable and indolent I treat as specific, they possessing their own specific modes of action, although that particular mode of action may be brought on by many immediate causes, in the same manner as the specific action of the gout may be brought on by various exciting causes, such as sprains, &c., the same specific susceptibility being capable of being brought into action by different exciting causes. There are other specific actions which can arise only from one specific exciting cause, as the pox. The irritable and indolent dispositions may be brought into action by different causes, and each by the same cause, as the venereal disease.

The irritable cannot sit easy under any misfortune of the whole constitution, or a part; this depends, I suppose, on some peculiarity of the nervous system or living principle. Irritable minds and irritable solids generally, though not always, go together. Irritable inflammations are most commonly induced by some violence; for even in a

habit the most irritable, there must be some other disease, or some violence, to bring this irritable disposition into action. One part, by becoming diseased, may take on the irritability of the whole system, and thereby produce relief. Erysipelatous inflammation generally, I believe, attacks those who are weakened as well as irritable. The cure or resolution is not very easy; for it is much more difficult to assuage than to excite an irritable habit. Opium internally and externally is certainly useful; as are also poppy fomentations and poultices. Lead has been recommended; but this, I believe, lessens power, and here it is action only we wish to have lessened.

In such habits where an abscess is required to be opened, a caustic may be the best means of opening it, especially if opium is applied with it; opium being at the same time given internally. Where the irritability is accompanied with weakness, there the bark may be also necessary. I have seen cases of sores in such habits where the mildest applications, as lint dipped in the sweetest oil, have given extremely great pain; in these cases, I have often, with success, applied spirits of turpentine, balsam of Peru, sulphur, and other applications possessing a degree of causticity; these, indeed, have given great pain at their first application, but this has soon gone off, and greatly relieved the part.

INDOLENCE.

Among the local effects of indolence may be reckoned—1st, irregular growth or monstrosity, as it were, of parts; 2dly, thickening of parts; and, 3dly, the addition of new or adventitious substance: these may be the consequence of an interstitial increase, which may be either diffused or circumscribed. Indolence, like irritability, may be either of the constitution or of a part only. Inflammation in the indolent constitution must still depend on action increased beyond that degree which is peculiar to that constitution; although this increased action here does not reach the inflammatory action in a sound constitution, nor, perhaps, exceed even the natural and healthy actions of such a constitution.

The indolence may not always depend on the constitution, but on the nature of the part, as bone, ligament, &c., or on the nature of the disease, as scrophula and scorbutus. It is not indolence alone which will constitute disease in a part; there must be besides some immediate cause affecting the part either slowly or suddenly. One cause of the thickening of the coats, &c. of tumours in this constitution may be owing to the disposition to throw out coagulable lymph continuing longer than when the inflammation goes through its stages in its usual time. The circumscribed interstitial effusions may be those which constitute wens, scirrhi, &c. Ossification, or the deposition of calcareous matter, seems a consequence of indolence, being generally found in parts which are naturally indolent; such are ligaments, coats of arteries, &c. All thickened parts may be said, in some measure, to contain newly-formed parts. This thickening of parts, I observed (when upon inflammation), was a consequence of increased action; and here we also have it with indolent constitution; but still it may exist with greater

action than is natural to that constitution ; besides, inflammation may depend on a peculiar mode of action, which, in a constitution possessing its natural powers, may be carried on to violence; but in the constitution we are now treating, the peculiarity of action may exist though that action be not violent.

Among the causes of indolence of action in a part is pressure or stretching in a slight degree, which, if in a greater degree, would produce inflammation and irritation. Varicose veins are produced by the internal pressure from the column of blood, which, as in other cases of pressure, produces a thickening of the part ; the veins sometimes become so thickened as to have their cavities nearly obliterated. The cuticle likewise is thickened by pressure, as in corns : the cure is in removing the pressure. A curious fact is, that there is often to be found a sacculus mucosus, as it were, between the corn and the cutis, and between this again and the capsular ligament of the joint, allowing the motion of the corn on the joint.

Cold has the power of producing indolence in a part or in the constitution. Cold does not immediately obstruct the actions of the whole machine or of a part, but calls forth, at first, another operation of the machine, that of producing heat. Cold, by exciting action at the same time that it lessens the powers, is very likely to be the cause of death in a part ; the inflammations produced by it are of this nature, consisting in an increased disposition to act with diminished power : of this kind are chilblains. In these, as in other diseases produced by cold, there are two stages, the irritable and the indolent : an attention to the stage may undoubtedly be necessary ; but I believe, even in the first stage, those means which give a gentle stimulus may be necessary. Of this kind are many of the applications for chilblains ; thus I have seen chilblains of a purple hue, and considerably inflamed, by the application of oil of turpentine assume a healthy pink, and have their inflammation lessened. Thus it is that steeping the feet and hands in hot vinegar is of service. Chalk is used on chilblains very properly ; first, from the friction ; secondly, its being a bad conductor of heat. The division of the diseases of indolence from its effects is, first, the increase beyond the natural growth in a part ; secondly, interstitial diffused thickening, as of a limb, or part composed of dissimilar parts or interstitial circumscribed swellings in any part ; thirdly, parts increased by the growth of newly formed parts. With respect to the first of these, it may be observed, that parts sometimes take on a preternatural growth, producing a kind of monstrosity. The seat of these is mostly in the cellular or adipose membrane, and are generally roundish bodies, soft and pulpy to the feel, sometimes broad at their basis, but most commonly pendulous from a narrow stalk ; these seem to be the same of the cellular membrane as the exostosis is of a bone : I have seen many cases of them. They sometimes form what is called the double chin in a very great degree ; they likewise form on the belly, face, &c. They sometimes produce absorption of the parts beneath, the bones underneath having been observed to have undergone absorption. Another preternatural growth of a natural part is that of the fat, which may be accumulated in the same manner in any part of the body externally or internally ; these may in general be distinguished, by the former being of a regular uniform softness, whilst the latter appears

to be composed of solid pieces of fat, moveable on one another, and having a surface irregular to the feel. Of the second kind, or diffused thickening of a whole limb, we may observe, that this most generally happens in the lower extremity, producing so great a swelling as not to allow of pitting, and generally comes on slowly; and here it seems to be a disease depending on situation of place, being almost peculiar to the people of Barbadoes, as the swelling of the thyroid gland is peculiar to Derbyshire and the Alps, and of the testicles to some parts of Africa: I have, though very rarely, seen it here. Although it is not called dropsy, I think it may deserve that term, as it is an effusion of a fluid in the cellular membrane, and that without inflammation. It is more frequent in the young than the old. I once saw it in a boy about twelve years of age. One of its immediate causes may be its dependent situation. With respect to the cure, I cannot say much: the above boy I ordered to rub in mercurial ointment on the legs, and then roll them; if these had failed, I should have recommended sea-bathing; but he used rolling without the ointment, and got a cure, so that here pressure produced a cure by bringing on a waste by absorption. There is seldom much pain with indolent swellings, or much inflammation or mischief from them, except by their pressure on other parts. Interstitial circumscribed swellings in a part, like the others arising from indolence, are very difficult of cure; nor is it easy to say whether the indolence is of the constitution or of the part only; but I should suspect most indolent diseases to have something specific in their actions; and although by bringing on increased action we may sometimes get rid of the diseased indolent action, yet we are not to forget that the action we increase may be ill action, and thereby mischief be done. An application of mercury may be kept constantly on the part, for the sake of giving to it a degree of irritability (which property it possesses), not of inflammation; this may bring on better action, and thereby prevent that kind of inflammation which their indolence would lead them to. Electricity may be used, though I have never seen much from it. Many indolent swellings remain quiet for a long time, content, as it were, with their situation, until disturbed by some violence. Resolution of the part into its primary state, and the production of good matter, are the effects of a salutary inflammation; but no such thing is to be expected from cancer or scrofula having its inflammation increased.

Suppuration of these indolent Parts.—Generally, if they suppurate of themselves, they fall into that unkind suppuration which is accompanied by decrease rather than increase of power. The salutary process which occurs in the sound abscess does not take place here. When suppurating, stimulating applications may be necessary to bring on a proper degree of inflammation and suppuration, for as the ulceration is quickened the ill disposition is lessened. They should not be opened too early, as the matter is a very good stimulus: the opening, when made, should be sufficiently large, sometimes a crucial one, or two forming an ellipsis or circle, according to the size or form of the tumour; and even it may be sometimes necessary to scarify the edges of the abscess. All these may sometimes be insufficient, a repetition of incision being required; and this may bring on action from necessity, i. e., from the wounds made. In ulcerations of this indolent nature, applications termed balsams have been used, and sometimes with

success. Either of the balsams with red precipitate is a good application, as are also tincture of myrrh, and calomel and lime-water. All these, to produce a good effect, should be frequently used: three times a-day is the least that can be dispensed with; for their efficacy is gone as soon as the surface of the wound is protected from them by a coat of matter.

TUMOURS.

A TUMOUR I term a circumscribed enlargement in a part from disease, not of the whole part. The circumscribed interstitial enlargement of common parts seems to proceed from an accumulation of the coagulable lymph in the cellular or adipose membrane, or both. Whether the tumour is composed of entirely newly formed parts, or any of the original remain, I cannot say; but I believe the latter are generally absorbed, and their place supplied with that peculiar to the tumour. The mode of increase of the cancer seems to be in this way,—the mass consisting of partly cancerous and partly of the original sound structure, the latter lessening as the former increases. Wens may be considered, then, as tumours in the part, not of the part. They sometimes remain without increase, and sometimes they increase very fast. When cut through, they have the appearance of the section of a lemon, though without that regularity in the centre; and they are often found to contain calcareous earth. Resolution certainly is to be wished for, though I fear we have very little chance, when beyond the reach of external applications. When they are externally situated, the same means may be used as for diffused swellings. Being circumscribed by dissimilar parts, their sympathy is considerably confined. Bringing them to suppuration is bad; extirpation is best, and that as early as possible. In doing this I have laid bare the carotid artery two inches and more, and have dissected from behind it: I have done the same with the temporal artery and internal jugular vein.

Tubercles are spurious kinds of tumours, and seem generally to be an affection of a lymphatic: they are found in the brains of young children, on, and in the liver, spleen, uterus, coats of intestines, peritoneum, epiploon, lungs, &c. How far their origin is glandular I cannot say. Tubercles of the lungs seem to be of a scrofulous nature.

Tumours of the skin are called warts: those which form from internal canals with external outlets are termed polypi. Warts are external, or superficial: thus they form on the inside of the lips, beginning of the vagina, and on the prepuce. Where the cutis is firm, so are these; but they are not so where the skin is loose. They seem to arise from the skin of the part, often growing from a very small surface, and at length obtain a power of growth in themselves: their bases seem to be in the cutis. Polypi grow from the internal membrane of the nose, vagina, urethra, and, I believe, also from the rectum: they differ in different parts. In the nose, several arise from the same root, and have a semi-transparent appearance. They are best extracted by the forceps. I have seen a tumour with a bony case growing out of the os maxillare inferius. Tumours often arise from the alveolar processes, which must be extirpated.

TUMOURS IN BONES.

Besides those affections of bones which were mentioned when on the bones, there is the following disease of bones, viz. tumours of bones, which may be formed in consequence of extravasation of blood, or scrofulous suppuration. 1st. Of those from extravasation of blood. The situation of these is various, but the situation most extraordinary is when they possess the inside of the bone, and produce, by the stimulus from their pressure against the inside of the bone, an absorption of the bone itself, hollowing it out, so that, at last, the bone becomes a mere shell, and exceedingly fragile. We do not find in these cases such an ossific disposition in the surrounding parts as in those cases which were noticed when on the affections of the bones; except, indeed, when it happens to the bones of the leg or thigh, where strength and support being needed, nature forms new bone to supply the deficiency in the old. Those fractures which have taken place with so little force as turning in the bed (as was the case with Lady Blandford and the Archbishop of Canterbury, and a patient in St. George's), may be in consequence of this disease. This was the case with Mr. Geo. Grenville, as appeared on inspection after death. The next kind is where this tumour is composed of a matter like that found in scrofulous tumours in soft parts. This tumour goes on increasing until, sometimes, it attains an amazing size; these happen more freqnently in the upper end of the tibia than in any other part, and are called spina ventosa. They occur pretty frequently also in the bone of the lower jaw. This is an encysted tumour, formed in and filling up the whole of the cavity of the os humeri of an ox.

ENCYSTED TUMOURS.

The cysts containing these are either natural or formed by the disease; natural, as the tunica vaginalis when containing a fluid morbid in quantity or quality, fallopian tubes, the uterus or oviducts of animals, when, for instance, their fœtus or eggs are preternaturally retained; these parts then taking on the nature of the coat of an encysted tumour. Encysted tumours give a feel much resembling that of a solid tumour: they are of a specific nature, and original diseases, as far as I can discover, though I must allow that I have seen some where, I believe, they might have been originally solid. Encysted tumours are of three kinds:—1st, hydatid; 2d, containing various kinds of matter of different degrees of consistency; 3d, containing curdled substances. The first kind of encysted tumours is the hydatid. This may be either found in a natural cyst, as that of the tunica vaginalis, pericardium, &c., or in a cyst formed by the disease; and these are of two kinds, both of which are formed of the cellular membrane of the part, and separate themselves from the surrounding parts; the first of these are filled with transparent serum; the other kind is lined with a peculiar kind of matter, and seems disposed to form others: of these the first is the most frequent. Some parts are

more disposed to them than others, as is the case with the brain, testicle, &c. I have seen a congeries of them on the neck of a woman, filling up the hollow from the head to the shoulder, also on the upper end of the thigh. The second kind differs from the former, as I have just mentioned, in that its coats are composed differently; for, as the coat of the first is composed of the part only where it is formed, the latter, besides the outer, has this peculiar inner lining of a dusky white hue, having an elasticity somewhat similar to a jelly, and is about as thick as thin pasteboard, and about as strong as thick wet paper. We have sometimes many layers of these coats detached entirely from each other, formed one within another, making a set of hydatids resembling a nest of pill boxes, which I call the first species of this kind, the formation of which may probably be accounted for in this manner: suppose a small hydatid formed; this, by its stimulus on the surrounding parts, obtains the formation of a cyst, in which it becomes enclosed; this outer coat by the same stimulus may become very vascular, and from the continuance of the same stimulus coagulable lymph is thrown out on the inside of the outer coat, which forms another coat between the first two; this is thrown off, and, after a time, the same process being repeated, more coats are formed. The second species has the same external strong coat, which includes, generally, a great number of unconnected and detached hydatids of different sizes: these included ones are perhaps first formed, and, by their stimulus on the surrounding parts, obtain this strong coat. Hydatids have little or no sensation. Some parts are more likely to have hydatids formed in them than in others. Among these the uterus very frequently has them. In the ovaria also they are often formed to an enormous size, so as with difficulty to be distinguished from an ascites, but by the beginning and progress of the disease. The hydatid of the ovarium is first made sensible to the observer by a swelling beginning at the bottom of the belly on that side on which the diseased ovarium is situated. Tapping is here only a palliative cure; and not only so, but perhaps a partial one also, as there may be many cysts. When tapping is had recourse to, where this is supposed to be the case, a large trocar should be used. But I cannot see any reason why, where the disease can be ascertained in an early stage, we should not make an opening into the abdomen and extract the cyst itself: why should not a woman suffer spaying without danger as well as other animals? The merely making an opening into the abdomen is not highly dangerous. In a sound constitution, perhaps, a wound merely into the abdomen would never be followed by death in consequence of it. The kidneys are likewise subject to hydatids, which are sometimes formed in the substance and sometimes in the coats of the kidney, as may be evident by their coming away entire with the coats of the kidney. In the liver they are exceedingly frequent, and are here generally the second species of the first kind, where many of different sizes are contained in one large sac; this larger sac sometimes bursts into the cavity of the abdomen, forming a dropsy of that cavity: they sometimes also point outwardly, like an abscess. They sometimes burst into the excretory duct of the gland on which they are formed, and are that way discharged.

Case.—A gentleman had a considerable swelling on the left side of the belly, which had been a long time collecting, and evidently contained a fluid. Of a sudden a con-

siderable quantity of fluid was discharged from the bladder through the urethra, and with it a great number of hydatids, the larger broken and the smaller whole: they continued discharging for a considerable time, but at last stopped; and he has since enjoyed perfect health.

Hydatids are also found in the substance of the brain, and more frequently in the plexus choroides. They are also sometimes found in the thyroid gland; and likewise occur in the cellular membrane of other parts of the body.

The second kind of encysted tumour is that wherein matters of various kinds are found in them, such as hair, &c.: thus, in those of the ovaria we often find oil and hair. Freely opening these tumours will generally be sufficient to their cure, by producing death in the sac; but where this is likely not to be the case, it is best to dissect the sac quite away, as the remaining sac sometimes, from its peculiar surface, will not be disposed to suppurate, and therefore the healing will be prevented.

Case.—A gentleman had a large encysted tumour on the muscles of the abdomen: this was opened by taking out a large circular piece of the integuments, comprising the fore part of the sac. The wound of the integuments suppurated, but the internal surface of the sac, which was now fully exposed, never suppurated in the least, so that the wound of the integuments granulated and healed, tucking down the integuments to this surface of the sac. The patient has remained well ever since; but has a large cicatrix, part of which is composed of that which was the internal coat of the sac. The surface of the internal coats of these tumours have a skin somewhat like that which covers the glans penis, different in some respects from that with which the rest of the body is furnished, but not of that nature as to suppurate on exposure.

CUTICULAR ENCYSTED TUMOURS.

In forming the sac of these to produce the surface just described, the cellular membrane takes on the nature of the cutis, and, like the cutis in other parts, is also covered with a cuticle, and in some instances it is also furnished with hair, which is probably thrown off at certain periods; and thus it is, probably, that we may account for those tumours of this kind which are found filled with hair coiled up. In most of these tumours there is also found a cheesy matter, like that secreted on the glans penis and prepuce. These cuticular encysted tumours are found very frequently, of a small size, about the face and eyelids: for their cure, they need only be freely opened or dissected out.

NEWLY FORMED PARTS.

These may be formed, as I have before observed, from extravasated blood, and from granulations; but one circumstance is extraordinary, which is, that these parts possess not the principles of long life as strongly as do originally formed parts, therefore we find

in the former a greater disposition to suppuration, ulceration, and even mortification, and that they pass through these states remarkably quick. The inflammation of these parts, therefore, requires more care in the management of it, as there is more difficulty in retarding it than in other parts, from the great rapidity with which it passes through its different processes. If the powers of life are weakened, i. e. if the constitution is weak, the part may lose its life directly ; but in these cases it is most generally to be attributed to this peculiarity of the newly formed parts. The rapid progress made by inflammation in these parts is really amazing to one who has not before remarked the difference in this respect between a newly formed and an original formed part. If mortification comes on from this cause, the separation of the dead part is in the same degree rapid. It seems as if nature, having deposited this newly formed matter, thinks it has a right to remove it ; thus it is that the matter of a cicatrix, or the new parts uniting a simple fracture, are more likely to be taken up than original parts : but one circumstance is particular, viz. that the matter which is the result of extravasation merely may be taken up by absorption only, whilst those parts which have been formed by granulations require suppuration and ulceration to produce their absorption.

FISTULÆ.

The fistulous part itself, if in a sound part, is not the disease, but only a sign of it and a consequence of it. Fistulæ may be of two kinds ; first, discharging (as artificial ducts) secreted liquors of a gland with extraneous matter ; secondly, they form the passage for the pus of a diseased part. The first is generally, if not always, accompanied by the obliteration of the natural duct, which may be from a thickening of its sides, or from ulceration, or from accident ; these are generally, by shutting up the natural duct, a cause of new passages being formed, to effect which inflammation and ulceration take place, when with the fluid of the part matter is discharged ; it then may be termed a fistula ; if the liquor of the part only is discharged, it is then only an artificial duct.

Fistula Lachrymalis.—When succeeding the small-pox, it has been supposed to have been the consequence of a pustule happening on the mouth of the duct, the cicatrix of which, upon healing, had pursed up the mouth of the duct, so as to entirely stop it. I cannot think that this is the case, but should rather suppose it to be the consequence of inflammation uniting the sides of the duct. Where matter has been forming in the lachrymal sac, we often find the lachrymal sac, instead of being so thin as to admit of the operation, exceedingly thickened, as if nature was determined to prevent the escape of matter into the nose, but resolves that, as in other cases, it should make its way to the surface. The operation should not be performed too hastily, as sometimes when it has, I suppose, been only a thickening of the sides, I have known the obstruction give way.

From an obliteration of the ducts of the glands of the lips, a circumscribed tumour is formed on the inside of the lips.

From an obliteration of the ducts of Cowper's glands I have seen a very large tumour formed at the entrance of the vagina : I once saw one very large, which had been mistaken for a rupture : both in this and the former case an opening should be made as early as possible and as nearly as possible to the former opening of the duct : this should be either a crucial incision or a round opening made with caustic, which may serve in future for an artificial duct.

Duct of the Parotid Gland.—When obliterated, a needle and thread may be passed through the cheek and kept in as a seton until the wound has become fistulous ; then the wound may be refreshed externally and healed.

The second kind of fistula is from disease, or is a deep-seated wound where there is a disproportion to heal between the two extremes of the wound. The causes of this kind of fistula may be, first, unfavourableness of the opening of the previous abscess, allowing part of the matter to remain, which by its pressure may produce a backwardness to heal ; secondly, backwardness to heal, arising from parts which naturally are backward of healing, or from parts which are become so by disease. It is not the matter lying between the sides of the wound which prevents its uniting ; for if this were the case, it might prevent every wound from healing.

Fistula in Ano.—Encysted tumours sometimes are formed near the anus, and may be distinguished from the more common abscess by the tumour having so long preceded the inflammation and ulceration.

The not healing of fistula I apprehend to arise from the sympathy of the sound part with a diseased part deeper seated, stimulating it so as to frustrate any endeavours it may make to heal : the disease may, for instance, be in the prostate gland, and the wound at a distance in the urethra ; and then this will not heal. But if a person is cut for the stone, here is a wound in the urethra and another higher up in the bladder ; but the wound in the urethra will heal, because it does not receive the stimulus of disease in a deeper seated part : this is one proof that the constant discharge of matter through it is not the cause of the fistula remaining. Besides, supposing several sinuses, all reaching to the same diseased bottom, and proceeding therefrom : let but one of these be opened to that bottom, so as fully to expose it, and they may all heal. In removing the obliteration or obstruction of the urethra, a bougie may produce a similar irritation with a diseased bottom, a circumstance which should be attended to.

A diseased bottom, I have before observed, might have many fistulous sores leading to it ; and that if one of these be laid open, so as to give a healthy disposition to the bottom of the wound, all the sinuses will heal. Now this must be a proof that the opinion I have advanced is true, viz. that the bottom of the wound being diseased is the cause of the fistulæ, and that the cause of the fistulæ is not to be found in the fistulous wounds themselves : for that, were this disease at the bottom, be it what it may, removed, it is my opinion that these fistulæ would generally directly heal. The cure must,

therefore, consist in the removal of this first cause ; thus when they are the consequence of the obstruction of a natural passage, as of the urethra, it will in general be sufficient to remove that obstruction to procure a healing of these. It sometimes happens, in strictures of the urethra, that the wounds, indeed, do not heal upon the removal of that stricture ; but where this is the case, there is still disease in the urethra, and that generally farther up.

Of the second kind.—When the fistulous disposition is supported by the pressure of any matter remaining in some dependent part, this must be laid open, and will generally prove sufficient for their cure. In fine, when these originate from a diseased bottom, that, if possible, must, in the first place, be removed ; but this is often impossible : where it cannot, therefore, be performed, the parts, by an incision, should be fully exposed ; but this also is sometimes impossible, as in the lumbar abscess, and fistulæ of the joints. These fistulæ are generally preceded by abscess, and are usually found about the anus. Now in the opening of abscesses about the anus, therefore, it is not sufficient to open them only where the matter points, but to lay it open to the origin of the matter or the diseased part.

RESTORATION OF THE MOTION OF JOINTS, WHICH HAS BEEN LOST BY DISEASE.

Before this is attempted, the disease which produced it must be removed ; because otherwise the disease will be increased by the attempts at motion.

Case.—A child with stiff knee was ordered to sea and a warmer climate, and seemed to be mending ; but its friends hearing of a man famous for restoring motion to diseased joints, applied to him, who worked the joint away like an old hinge ; by which inflammation was brought on, and the joint so much further diseased as to require amputation. But when the disease is removed, then it may be necessary to call in foreign power : this may be, first, either the patient's hand or the hand of another ; secondly, increasing the weight or momentum with which the joint is moved, by adding to the weight of the hand, and by so situating the parts that their gravity may produce the greatest effect on the joint. Where, in consequence of stiffness of the joint of the knee or thigh, the heel is prevented from reaching to the ground, if the heel is entirely and fully supported, there is no room for it to be brought down by the action of the muscles ; but supposing it to have been fully supported, this support should not be entirely taken away, and at once ; for that, throwing the patient into the easiest posture, would pitch him on his toe ; it therefore ought to be done by degrees, leaving the heel so that it shall not be entirely without support, and yet require some action of the muscles to bring it down.

LOCKED JAW.

This may be considered as a partial effect of tetanus, and generally the beginning. When the muscles on the fore part of the trunk are affected, it is termed emprosthotonos ; when on the back part, opisthotonos. They may be classed with the unnatural or involuntary contractions. Of these is formed a genus of which tetanus and locked jaw is a species, and of which the subsultus tendinum, spasmus cynicus, wry-neck, &c. are lower species. Horses, cows, deer, monkies, and other animals, are liable to this disease. A stag, I had, died of it. Some parts are more disposed to these affections than others are, as the muscles of the lower jaw ; the order of muscles next disposed to it are those which are nearest. The disease spreads, by sympathy I suppose, through the different muscles. Its cause and nature have not hitherto been sufficiently attended to. Having followed wounds very frequently, it has been supposed a consequence of irritation from those wounds ; but these wounds do not comprise the whole of the cause, for irritation merely, such as tends to produce inflammation, will not produce it : a slight irritation may be the exciting cause, but as a predisposing cause there must, I think, exist a weak and irritable habit. We seldom find it in a good constitution, or accompanying inflammation. Where there is inflammation, it is always previous to the spasm, the latter coming on generally when the inflammation goes off. This disease often happens from very trifling exciting causes ; yet we are not to confine ourselves to these, but likewise attend to the predisposing cause, or the disposition in the habit for such actions. It is not the consequence of irritation increasing the action of the living principle, as in inflammation, but an irritation of the nervous principle ; or, in other words, the disposition consists in irritability of the nervous system, such as is possessed by those who have a proneness to nervous complaints, not an irritability disposing to inflammatory symptoms. In such a disposition, it is my idea that the irritation of a trifling wound (and perhaps from some peculiarity in the irritation) may be the immediate cause, even though the irritation may not amount to the height of pain ; and this irritation may have more effect than a greater degree of pain ; thus, tickling may have a greater effect on the nerves than a violent blow on the part. An injury will have a greater effect on the minds of those of weak constitutions, than on the strong. Weakened constitutions, we know, are always prone to what are called nervous symptoms. In a woman with child, the nervous principle is weakened, though the living principle may be very strong, and exhibits an instance of this kind of constitution.

Case.—I once threw a stone at a deer with so considerable an exertion as to produce an extravasation of blood in the arm ; the muscles were so affected that a loss of motion in the arm immediately followed. I felt myself exceedingly weak, and was very pale : after a little time cramp came on in my leg ; but at last this and the other symptoms went gradually off : if the irritation had continued, a locked jaw might have come on. Now here, from the irritation arising from the injury done to the arm, a spasmodic affection was produced in a person immediately before in perfect health. This complaint is

most frequent in warm climates, and is even very rarely found in cold ones. Preceding inflammation may be sometimes a predisposing cause, by rendering the nervous system more irritable. Wounds of tendons, ligaments, &c., are likely to be the immediate cause, from their possessing so very slight a power of healing, and thereby keeping up a more constant irritation on the nervous system. How much a wound in such a part weakens may be deduced from observing, that the limb wastes when such a wound has existed any considerable time.

The wounds producing this disease may be supposed either considerable or slight; the first seem to act as a predisposing cause as well as immediate; the latter, as immediate only. In the first case, the patient is not attacked with the locked-jaw until the inflammation is nearly gone off, in general not until a good suppuration has come on, nay, in some I have seen the healing of the wound so far advanced as to be completed before the jaw unlocked; whereas, in those from slight causes, the locked-jaw comes on before the wound begins to heal; and in these cases the disposition may be supposed to be already subsisting. It much oftener appears as the consequence of a slight wound than of a considerable one. It may arise in consequence of other weakening causes, as fever, flux, &c.

The period at which it becomes dangerous, by attacking vital parts, seems to be before the constitution has become habituated to it; this is generally within a fortnight: if it does not kill within the first fortnight, the patient generally recovers, and that even though the symptoms continue violent some time afterwards. It kills by the disposition increasing, and the effects extending until they reach some vital part, and which it affects with spasm: in this manner also I think the gout kills.

The cure has hitherto been attempted by every thing which can be termed antispasmodic, but with very little success; the one which has kept its ground longest is opium, though this, in my opinion, has not done the good that was supposed: the cases would, most probably, have done well without it. It may lessen the effects, but cannot remove the cause; it may prevent the simple sensation of pain in the mind, and may do good so far by preventing the pain from weakening still farther the patient.

Electricity seems to relax the spasm at the moment, but it soon comes on again. Actual cold seems to be the most efficacious remedy, and may be applied to the whole body, or topically to the part. If I were to have a locked-jaw, I would be put in an ice-house; the patient would do well, therefore, to remove to a colder climate. Internal medicines I know of none. Forcing the mouth open seems sometimes to do good; but I was told it once killed a patient.

In one case, where bleeding was performed about the tenth day of the disease, the patient fainted away, became immediately worse, and died soon after. In another case there seemed to be but little connexion between the wound and the locked jaw; the wound healed, and a considerable time before the jaw unlocked. Opium and musk were both tried in this case without any effect. In another case two grains of opium were given every half hour, and increased to three grains every quarter of an hour, with no good effect: volatile medicines were also given freely in this case. The spasm continued,

even a short time after death. In another case, the patient, who was quite bent backwards, was put into the cold bath, and was relieved a little whilst in the bath, but was as bad as ever when taken out: it was twice repeated with the same relief; but the moving him put him to so much pain that he would not allow it to be again repeated. Another patient was so much relieved, when the trunk and jaw was quite stiff, as to be found the next day sitting on the side of the bed. Being obliged to embark for Portugal I left the patient in this state with the surgeon.

SCROFULA.

This is a specific disease, producing particular effects appropriated to its specific nature: it has been thought to be of a contagious nature; but I have never seen reason to suppose this. It seems to have a power of making the adjoining parts sympathize with a part affected by it; but not in any great degree. Its matter does not seem liable to be acted on by the absorbents, and in this manner to affect the whole system; and hence I have no idea of inoculating the scrofula with small-pox. Other animals seems disposed to fall into this diseased action; monkies generally die of it here; young turkies are also often affected with it: a young boar I had died of it. I suppose every constitution to have a susceptibility of this disease in a greater or less degree; but this susceptibility is generally lessened with age. There is a great difference in different parts as to their being affected by this disease; some being much more affected with it than others are. Some constitutions and habits are more susceptible of this disease than others: these are those which are called delicate persons, who are very irritable or sensible of impression, their complexions fair and hair light: there seems, I think, in that class of people, a more languid circulation than in others. The parts most disposed to be affected by it are the lymphatic glands in every part, but particularly where they are most exposed, as in the neck and the lungs, which may be very properly said to have an external surface. It is not a disease of the absorbent system only, as it affects other parts of the system; and although it very generally affects the lymphatic glands, yet that is not the case with the lymphatic vessels themselves. The soft ends of the bones, the joints of the hands and feet, leg, thigh, and arm, are parts next in order affected by it. The age most disposed to this disease is from one to fifteen, and in rather less degree from fifteen to thirty, after which it is more rare.

This disease has generally been supposed to be hereditary; but it has long been my opinion that it is not so, and I cannot see that we have any right to draw such conclusions from the circumstances; for I have often seen it in children, when nothing like it could be traced back either in their fathers or forefathers; and again, I have seen it very bad in parents whose children have not had any appearance of it. I have, indeed, seen it run through a family; but in those cases the predisposing causes were sufficiently strong to account for the disposition without being under the necessity of considering it as hereditary. A disease to be hereditary should pass alike into all the descendants of the diseased parent—into the dark as well as fair complexioned; but this is peculiar to the fair

and delicate: if hereditary, it should be produced in all climates, and amidst all kinds of dispositions, which is not the case. I can, indeed, conceive a peculiar susceptibility for putting on a disposition for this disease may be hereditary, as well as there may evidently descend a greater susceptibility for small-pox, or other diseases; and this, I think, without any necessity for supposing the disease itself to be hereditary. The predisposing causes of this disease I therefore suppose to be chiefly delicacy of habit, and such an age as contributes to the increase of this delicacy: it may just be observed also, by the by, that the system it attacks (the lymphatic) is the most delicate in the whole body. There is another which is sometimes a remote and predisposing cause, and sometimes may be supposed to be an immediate one; it may with propriety, I think, be termed a predisposing and immediate cause; and this is climate. In Britain and in Germany, in about the same degree of latitude, it is very common; but as we go farther north we lose it by degrees, nor is it to be found in the warmer climates. The irregularity of weather I conceive to be the cause of its so frequently occurring in the places just mentioned. The human race, or other animals which are brought into our climate from parts where this disease is not known, become often affected by it: this is most frequently the case, as I have just observed, with monkies, who generally here die of it. Another reason for supposing that irregularity of weather may be the cause is, that it more seldom shews its effects in summer or winter than in spring or autumn, when the weather is so much more uncertain. Although I have acknowledged that there may be a constitutional susceptibility for this disease, yet I cannot allow that there is in this disease a constitutional action (such as in fever), but local action; in fact, there is a susceptibility for local actions of this specific kind; it is a disease rising up anew, as it were, every day, and seemingly often spontaneously, from the immediate cause not being detected. The immediate causes are many, being every thing which can produce diseased action whilst the body is under the power of the above predisposing causes; these immediate causes may, therefore, be small-pox, measles, chicken-pox, colds, sprains, rheumatism affecting the joints, venereal diseases, and the *use of mercury*. Scrofulous abscesses are attended with little inflammation, and often with no pain: the first time the abscess is discovered is, perhaps, not until it has made its way to the skin and become a tumour sensible to the sight and touch. Now, whether is it that the nature of the disease is such that it produces its effects without the true inflammation, or whether it is that the disease is of such a sedative nature that it prevents the effects only of the inflammation, as the pain, redness, &c.? The latter I apprehend to be the case. The indolence of these tumours, and the small degree of pain, lead me to think that it is owing to a specific sedative property in the disease; for we find it attended with little pain even in those who are otherwise of an irritable habit. When the pain is greatest, so is its progress quicker. There may be inflammation from other causes mixed with the specific disease we are treating of, in which cases the progress will be quicker. In cases where bone is absorbed, as in spina ventosa, the whole of the bone within the circumference of its action may be removed, and a merely scrofulous matter formed in its stead, similar in appearance to a lymphatic gland when affected by scrofula. As the inflammation appears to be imper-

fect, so also is the suppuration. The matter is often of a glairy nature, sometimes more fluid, mixed with a cheesy substance, and sometimes, especially when the matter has to pass through parts which are not scrofulous, it has the appearance of common matter. The ulceration is very slow also, and often becomes stationary. These tumours seldom come to a point, but generally come forward with a broad surface ; and often, whilst the sore continues thus stationary, there shall be no discharge, which must be accounted for by supposing that absorption is going on as fast as suppuration. The granulations seem to possess little powers of contraction to assist in the cicatrization, which is as backward as the other processes. The appearances which this disease puts on will depend on the nature of the part affected, and on the combination of various circumstances ; the first and most common appearance is that of a small and circumscribed tumour, such is the tumefaction of a lymphatic gland, &c. ; the second is when the swelling is more diffused, as in the swelling of the joints and in the larger indolent swellings in other parts of the body. The testicles are subject to swellings from this cause, as well as the breasts of women. These are attended with little or no pain, and do not produce swellings in the neighbouring lymphatic glands ; they will sometimes continue for a long time in an indolent state. I have also seen them between the breast and axilla. When the bones are affected, we seldom have a fair exfoliation ; the bone seems as if it had been eaten away by the granulations which have supplied its place. From this disease proceed white swellings, hip cases, lumbar abscesses, supposed cancers in the breast and testicles, consumptions, obstructions of the mesenteric glands, &c. Lameness and wasting of the limb often happens for even months before we shall discover its cause, which will generally be found in the knee or hip. Tubercles in the lungs may be considered as an effect of this disease. I have known many cases where there has been no pain before the matter has made its appearance, and this owing to their having been no preceding adhesive inflammation. In general, there may be some adhesions formed in consequence of the immediate exciting cause of the scrofula itself producing inflammation.

LUMBAR ABSCESSES AND HIP CASES.

When either of these are on one side only, they produce a lameness ; and what at first sight appears rather extraordinary, the leg of the diseased side is the longest : but this is easily accounted for, from the pressure being entirely on the other side of the pelvis, by which that side is necessarily thrown up, so that the pelvis thereby gets a tilt, the diseased side being thrown lower. But sometimes the contrary to this takes place, and the leg of the diseased side is shorter : this I cannot account for. Either of these lamenesses may occur for months before the disease shews itself in any other way. Consumptions in this country are, I think, generally from this cause (scrofula) ; which opinion will, I think, be confirmed by considering the habit of body and the age of those who are afflicted with this disease, together with the manner of its coming on, which is slow. The glands in the lungs are probably affected by cold as well as the lymphatics

on the sides of the neck. Perhaps when a consumption has begun with a slight cough, which has gradually and slowly increased, with little or no fever, we may set it down as proceeding from a scrofulous disposition; but if it began with a great shortness of breathing, fever, &c., it may be concluded not to be from scrofula. What renders it still more certain that consumptions generally proceed from scrofula is, that the lungs after death afford evident marks of scrofula. Now if consumption does proceed from scrofula, we should treat it at once as scrofula, sending the patient to a warmer climate and to sea-bathing, &c.; but this is generally let alone (warm climate) until the patient *can take no more physic*, or the physician can *obtain no more fees:* then is the patient sent to die at Bath or Bristol, or into a warmer climate, when it can be of no service. With respect to the sea-bathing, physicians will say, perhaps, What! sea-bathing in a consumption? Yes, I shall say, for the same reason that I should use mercury if I supposed its cause was the venereal virus.

Scrofulous Testicle.—The testicle is sometimes diseased from scrofula, and sometimes obtains to a great size: its slow progress, and its manner of beginning, point this out, and, different from the cancerous testicle, it has little or no pain, not even when ulcerated, except from the irritation of the skin. I have seen them generally at about sixteen years of age, but seldom in the younger, and never, I believe, in the old.

Scrofulous Breasts.—I have seen one which weighed from sixteen to eighteen pounds. Both in this case, and in that of the testicle being affected with scrofula, the tumour is different from that of cancer, in as far as the cancerous tumour is continually taking in the surrounding parts by the adhesive inflammation which accompanies it; and in consequence of its affecting the adjacent lymphatic glands and other parts, the spermatic chord becomes affected generally, when the testicle is the seat of the disease, and the glands in the arm-pit when the breast is the diseased part. But the true scrofulous tumour is unattended with the adhesive inflammation, and therefore is more of a circumscribed tumour, the surrounding parts not being swelled by the effusion of the coagulable lymph, as in the other case; besides, the surrounding parts are not, as in cancer, affected by the scrofulous tumour by continued sympathy (except when it reaches the skin); nor are the lymphatic glands the next in course affected by them, as in the former case. The scrofulous tumour is composed of scrofulous matter, the original parts being absorbed, as I before observed.

THE CURE OF SCROFULA.

This disease, we observe, originates in particular habits and at particular ages: these we cannot alter, but another great cause may be removed, that of climate. Where it happens in our irregular climate, an early removal to more warm and regular climates as of Italy, and near to the sea-side, should be recommended; and frequent short voyages should be also tried. The bark may be used, as also the cold bath, alkaline salts, hemlock, sea-bathing, and mezereon. With respect to the mezereon, I cannot

help thinking that the cases mentioned by Dr. Russell were of the scrofulous kind: thinking this, I determined, the first opportunity, to try it in an absolutely scrofulous case: the first which occurred was a case of swelling in the elbow-joint, which was very considerable, and certainly scrofulous, though there was rather more pain than usual in scrofula. The patient had been under cure for the venereal disease some little time before. The arm was rubbed with a liniment of gum ammon. dissolved in acet. scillit. without any good effect; after which she took the mezereon decoction, and, by mistake, the decoction she took at first was the compound one mentioned by Dr. Russell: the decoction being taken twelve days, she was nearly well, when the more simple decoction (℞ Mazereon rad., glycyrrh. āā ʒj; aq. font. ℔xij; ℔ss twice a-day) soon completed the cure. I have seen its good effects in many cases since, and in many cases likewise I have used it without any good effect. Sea-bathing may be administered either cold, tepid, or warmer: its specific power is the same in all, and it may therefore be varied in its application, according to the particular circumstances of the disease and of the habit of the patient at the time. It, indeed, does not cure; it only seems to lessen the susceptibility for the disease for the time, for the complaints return when the bathing is suspended; but this is no small advantage, for the susceptibility may thus be kept under until the patient has got older, and of a less delicate habit. Next to mezereon and sea-bathing is the hemlock; fossil alkali and burnt sponge have also been of use. With respect to regimen I do not know what to say, as the disease seems to attack those who are regular in this respect as often as those who are irregular. Clothing should be warm, and the warmest (as flannel) should be nearest the skin.

Topical Applications.—I never saw any good from stimulating applications, such as the turpentines, balsams, solutions of metals, as of mercury, copper, &c.: I have almost always found them hurtful. The best applications are, I believe, hemlock and sea water: these may be used both as fomentations and poultices. Free openings I recommend for the making indolent tumours heal; but cancer and scrofula are to be excepted from this rule. Scrofulous sores are often very irritable, and ready to take on the erysipelatous inflammation.

MORTIFICATION.

Life is a simple property of matter, of which we can form no adequate idea: on it depends preservation and action. Life may be of the whole or of a part; so that a part may be deprived of its life independently of the rest of the constitution. The loss of the life of a part, seems to me to depend on the loss of the circulation of the blood through that part: this may be effected by many causes. Natural death seems to be the consequence of an alteration of that arrangement of the particles of matter on which life depends; and in this case a gradual alteration takes place in the parts thus deprived of life, whereas, in a part deprived of life in consequence of mortification, a sudden visible alteration takes place in the part: it becomes of a purple colour, inclining to a

livid hue ; whence we may infer that there is a difference in the manner in which the death of the part is produced in this case and in that of the natural death of a part.

In this case of mortification I should suppose that the causes produce this ultimate effect by some specific action different from that which precedes a natural death of a part. In the case we are treating of, death taking place in a part is commonly succeeded or attended with great pain in the part, which pain resembles that from burning : the part then becomes livid. The same kind of pain and livid hue accompanies the destruction of the life of a part by pressure ; the colour shews, in both instances, I think, a stagnation of the blood. Besides the many known causes of mortification, it seems sometimes to arise from causes very little known or understood ; in which cases there may probably be a greater disposition for that specific morbid action on which the mortifying depends. It would appear that there is in those cases a stagnation prior to the mortification taking place ; but on what particular action this morbid effect depends I cannot pretend to say. I have suspected somewhat like a spasm on the smaller vessels ; and that spasm may produce stagnation and mortification is, I think, evident in the case of priapism. There are instances where the mortified part has continued attached to the sound for a long time ; but I have not seen many of these. A change of action seems to take place in mortifying parts, either before death or in the act of dying. In cases of mortification there seems to be a diminished power and an increased action together ; and almost always, when not entirely caused by accident, there seems to be a deficiency in the powers of life ; for if the patient is young, we shall find it has been preceded by fever, and that most probably of the low kind, or by some other weakening circumstance : we also generally find it in such parts as naturally may be expected to possess the powers of life less strongly, as the extremities. Debility I think, therefore, is the predisposing cause ; and under this state of diminished powers we have it arise from wounds, bruises, and other species of violence, producing increased action, which the part being too weak to bear, mortification ensues. In the same manner in those who are frost-bitten, the powers, though diminished, exist, but the actions are stopped. Warmth only is wanted to put these again into action ; but if, by the too quick application of this heat, great action is suddenly induced, this may be more than what the weak state of the parts will bear, and the death of the part may be induced, the powers of life in the part being, as it were, destroyed by their own action : the same holds good with those who, having been nearly starved, feed with too much eagerness. An eel which had been frozen, but was recovering, upon being brought into a warm room died almost directly. I have observed that when blackbirds and thrushes, driven into out-houses by very severe winters, have been taken in-doors, they have soon died ; it appearing in all these cases that warmth produces an increased action of the powers, even to the destruction of those powers. Parts whose powers are weakened seem very much disposed to take on the continued sympathy, and hence more easily inflame from any small violence : thus the erysipelatous inflammation, which is generally accompanied with weakness, has this continued sympathy to a great degree. Mortification may be also a consequence of inflammation, carried on for a very long time, being at once an imme-

diate and exciting cause, and, by inducing the weakness, a predisposing cause. Life of a part may be suddenly destroyed by accident, or may be the consequence of increased action in weakened parts, or habits.

Cure.—It is evident from former treatment that practitioners were sensible of the weakness, that is, the predisposing cause, but they seemed to have been ignorant of the immediate cause, viz. increased action; for bark, wine, cordials, stimulants, &c. were ordered: by these increase of action was obtained, but not of power; so that nothing was hereby gained, but much probably lost. They had a notion of antiseptic powers also in their applications as well as in their internal medicines, and employed scarifications, hot dressings, fomentations, &c.; but, surely, nothing could be more improper than these applications, calculated, as they were, to increase the action at the expense of power. Cordials and wine I strongly object to; but this does not hold against the bark, which I believe has an effect of increasing power. Opium may be of service, by lessening the action, though it may not give real strength.

Death of a part may be produced by either the actual or the potential cautery. The potential cautery is used when, by art, we want to destroy the life of a part. The caustic alkaline salts are mostly preferable for these purposes, and, according to the particular circumstances, may be used in the simplest form, or may be mixed with calcareous or with saponaceous matter. In the more simple form it may be used often very conveniently, as in the opening of an abscess, the parts over which are very thin: here the lapis infernalis may be used by wetting one end of the stick, and applying it successively, holding it a few seconds in a spot, to each part, so as to comprise the piece intended to be removed. In this manner the abscess, if the integuments are very thin, may be opened in ten minutes; but this form of caustic requires the surgeon's attendance during its operation, as it liquefies so fast, that, were it not kept constantly wiped round the circumference, it would spread much farther than was intended. The rest of the caustics are the metallic salts (blue vitriol, lunar caustic, &c.), acids, &c. The lapis infernalis abovementioned produces a brown jelly-like slough, as if it dissolved the part; but the acids, on the contrary, seem to coagulate the parts. Arsenic, indeed, seems to have a specific action besides its chemical: there seems a difference in its effects, resulting from some specific mode of action in it. The pain of caustics may be alleviated by making up the caustic with extract of opium, and by putting on an opium plaister over the part for an hour before. The skin it is which seems to give the most pain in dying. I fancy the cellular membrane has a power of separating quicker than the true skin. The separation f a mortified part is performed by the absorbents acting on the surface of the living part next to the dead part. The first step is the death of the part to be thrown off; then the living part is stimulated to throw the dead part off; and this is done sooner or later, according to the quantity of life before contained in that part and its nearness to the source of circulation; thus it is more slow in ligaments, tendons, bones, &c., as well as in the extreme parts. This process is, indeed, most slow in bones; as, besides the other processes, they have to absorb the calcareous earth. An inflammation takes place adjoining to the dead part, and on that surface it is the ulcerative inflammation

commences; but deeper down we have the adhesive. As the slough separates, a groove is formed between the dead and the living part, and at last a total separation takes place. Death in a part may be either from mortification or from accident; in the first case there must have preceded a disposition for mortification. It is a common practice to take off a mortified part or limb as soon as the mortification stops, and this is performed in the live part: but to this I object, as such an inflammation may be raised in the parts as they may not be able to support; and hence fresh mortification, to remove the bulk of the mortified part or limb. The processes which nature has instituted are not at all expedited by this; for it will take her as much time to separate a slough as thin as paper as one ten miles thick. It has been also recommended to cut out the sloughs formed by caustics as soon as made: the folly of this is evident, for nothing at all is effected by cutting into the dead part, as I have just observed; and if the wound is made in the live parts, it might as well have been done at first without the caustic.

CARBUNCLE

Is an inflammation of a specific kind, and has a termination peculiar to itself; it generally, if not always, begins in the skin. A mortification generally takes place in the part; but whether the mortification is to be ranked among those proceeding from the constitution, or whether it is a consequence only of the violence done to the part by the inflammation, I know not; but perhaps it may be an effect of both these causes. It often attacks persons whose constitutions are otherwise very good, and also attacks parts which are not naturally weak. It seems to be an effect of this specific action, like that of the small-pox, to produce death in the part it attacks. As a proof that they may happen in constitutions otherwise good, it may be observed, that patients troubled with these have recovered from accidents as soon as if nothing of this kind had subsisted. A curious circumstance is, their almost always appearing on the posterior part of the body or head, as on the back, back part of the neck, &c. I do not remember ever seeing one on the extremities, except on the back of the hand. They will spread amazingly, one arising at the edge of the first, and so on, until I have seen them cover the back of the head, and the back when that was the part attacked. They generally attack those who have lived rather above par, especially as to eating, and who are generally more inclined to be fat than lean: I have twice seen them succeed a blister applied to the nape of the neck in persons of the above description. Its first appearance is generally that of a small pimple surrounded with a very considerable hardness, and to a very considerable distance, greatly inflamed, and of a dark crimson hue: the tumefaction is considerable, but with a flattened surface. The pimple generally breaks, when a very little matter is discharged, and with little or no relief to the patient; for suppurative inflammation seizes, at the beginning, as in the erysipelas, the cellular membrane, and is immediately followed by mortification, exactly in the same course, i. e. running along under the skin; matter oozing out upon pressure through holes in the skin over the mortified slough, and,

when the opening is large enough to allow us to see the edge of the slough, we may press out matter from the cellular membrane of the surrounding parts as from a sponge. Now the question is, whether this matter is formed in the cells surrounding the diseased part; or is it formed in those cells which are to become dead? It spreads along the cellular membrane under the skin in a contrary course to other suppurative inflammations, which make towards the surface. This circumstance of its spreading is probably owing to its not being preceded by the adhesive inflammation, which in other inflammations limits the extent of the tumour, whereby the matter is pressed outwards, which nature, by the process of the ulcerative inflammation, is rendering the least resisting part. The surrounding tumefaction is not formed of coagulable lymph, as in the adhesive inflammation of other abscesses, but is the consequence of matter formed in those cells from the beginning, as the suppurative inflammation takes place at the first. In most cases, the cellular membrane entirely dies, and sometimes the skin also, when they separate entirely: sometimes the death of the cellular membrane is not complete, but columns remain which continue the connexion between the skin and the parts underneath. It is a curious question, why the skin should not be able to carry on the disease? Is it that the skin possesses greater powers than the cellular membrane? or is it, that it is a disease peculiar to the cellular membrane, and affects the skin only ultimately? Does the matter get on from cell to cell? Does it produce suppuration in each of these cells as it passes on? By what is it stopped at last? Is it by the adhesive inflammation at last taking place from the stimulus of the matter penetrating into cells beyond the sphere of the specific inflammation? After it has gone through all its processes, it will heal as kindly as any other abscess, as is the case in the small-pox. Nay, we may have at the same time all their stages in the same person, healing in one part, in a mortified state in another; whilst in another part they may be breaking out afresh.

CURE OF CARBUNCLE.

Bleeding is seldom proper in this disease; and we may observe, that bleeding does not seem so proper in any of the specific inflammations as in the common ones, except in those specific ones which happen in a constitution which may permit, nay demand it. By the present practice, we may collect the little necessity there is for bleeding in this inflammation; for the practice which has been more successful has been that where bark, &c. have been used: but, to say the truth, little good is done even by this treatment. In consequence of having observed this, I have been endeavouring to find a medicine that might have some specific power over this disease.

Case.—A man about seventy years of age, who had always lived well, and had been affected with universal dropsy about ten years before, of which he was cured by Dover's Powder, had a large carbuncle under the left shoulder, and three more were appearing on the back. The person under whose care he then was had given him a drachm of bark every six hours, without any good effect, and was now giving him calomel with opium, which was continued, and no specific effects observed; for although the first was

now healed, yet others had come forward. His health, which had been pretty good when these had first appeared, was now considerably reduced. As neither bark nor calomel with opium had been of any service, I said to Dr. David Pitcairn, Now do not let us permit this patient to be lost, whilst we are only using such means as experience has shewn to be of little or no effect; let us rather try something new ; for, David, this is a case more belonging to my province than to your's ; and I being an older man than you, have seen more of them than you have, and can tell you, what perhaps you did not know, that we have no powers in this case that are known. Now David is a truly sensible man, and not governed by form ; he therefore agreed, but wanted to know where we were to begin. Why with the first letter of the alphabet, and go through the catalogue of the materia medica, so as we do not stop too long on the letter B, bark, as is the case in general. But as the cicuta was a medicine possessing considerable powers, and these not thoroughly known, we began with that, and he took ʒss of the extract every day, but without any good effect. We then tried sarsaparilla ; and, knowing it could do no harm, we determined to give enough of it, so made him live on it, having it ground to a flour, with which puddings and loaves were made for his food, and a strong decoction for his drink ; but without any good effect. Now, Dr. Pitcairn proposed the elm bark, from having seen it, he thought, of service in erysipelas, and there appearing an affinity between this and erysipelas : this I assented to, but, from a thought which had struck me, wished to try the caustic fossil alkali ; so they were given together, and we thought they were of service, as it was during this course that the patient recovered, though it must be confessed that it was slowly ; but some fresh ones, which had shewn themselves, disappeared again. I have tried the fossil alkali several times since with, I think, evident good effects. I dissolve sal sodæ in water, and deprive it of its fixed air by adding lime to it. I have tried it on myself: I am subject to have boils come out of this nature, sometimes having six or eight at a time : they generally appear in the spring. I took this remedy when I was threatened by them, and never had fewer at any previous attack than I had then ; nor have I been so subject to them since. A gentleman asked my advice ; he had two or three of these appearing : he had some time before taken caustic alkali for calculous concretions. I advised him to take it again, and it put them back.

Topical Treatment.—Perhaps, in the beginning, the hole following the pimple may be sufficient ; if not, it may be enlarged ; but in the last stage I do not see what good effects we can expect from dilatation : when the slough is come away, it then may be treated as a common abscess.

POISONS.

It is difficult to define what a poison is, as almost all substances may kill in too great quantity, and perhaps the greatest number of those substances called poisons would not be so in very small quantities. Poisons may be of the mineral, vegetable, and animal, kingdoms ; the last of which may be of two kinds, that which is natural to the animal

being found in the animal during health, and that which is produced in an animal by disease. Poisons may act either chemically, mechanically, or immediately on the living principle: the action of the first two is only local, but the last may act constitutionally also.

My idea of a poison is, that it is a substance which has peculiar modes of irritation, or peculiar modes of affecting the living principle, and is capable of producing those effects in the smallest quantity conceivable. According to this idea, it will appear that I do not call even arsenic a poison, as it may be given in so small a quantity as to produce no effect: but the small-pox, and other morbid poisons, are instances of what I mean; for the smallest quantity conceivable of these will, according to our observation, produce their peculiar effects. But even the small-pox does not entirely come up to my definition; for after the habit has once been affected by it, it ceases to be any longer a poison to that habit. As instances of the different modes of action of different substances, we may observe, that powdered glass acts mechanically on the stomach, sublimate chemically, and the matter of cancer, &c. on the living principle. Poison may produce local, general, or both these effects. Of the first, is the matter of the itch, &c.; of the second, that of the jail fever, hooping-cough, &c., and perhaps the bite of the mad dog; the third kind is as the venereal poisons, which may produce both local and general effects. The effects of mineral substances may depend on their being united with the animal juices only, or may require a previous mixture with acids; these, when acting strongly, may be said to act chemically, but, when very much diluted, may act on the living principle as irritators. Vegetable poisons may be either the mere juice of the plant, or a secretion of the plant, or may have undergone some simple process, as distillation. Animal poisons, as I have before observed, are either natural to the animal, or morbid. Vegetables and minerals have their specific modes of poisoning, affecting, according to those modes, particular parts of the system: the animal acts chiefly on the living principle. The blood may be looked on as a fluid animal, composed of parts similar to the whole body, and possessing parts ready to furnish the body with. The natural animal poisons are either the flesh of the animal or a secretion; of the first we have an instance in the muscle and in the fish found by Captain Cook in the South Seas; the second we have an instance of, in the viper, &c.: these are secreted for particular purposes to the economy of the animals which possess them, and is as much a part of the animal as the blood from which they are secreted. These secreted poisons may, I believe, be made to poison the animal to which it belongs, though Abbe Fontana denies this as to the viper. These poisons may affect by contact only, or by insertion; of the first, is the sea animal called the medusa, also the ant, who only throws out the matter on the part. Some insects poison whilst they take in their food, as the gnat, ant, &c.

MORBID ANIMAL POISONS.

These arise from morbid states of the body, which originate either spontaneously or from the application of similar matter to the animal body. Cancer we see frequently

arising spontaneously; and I was of the same opinion with respect to the hydrophobic poison, but Mr. Meynell has informed me that he never had one of his dogs go mad but he could trace it back to a bite from some other mad dog. Some of the morbid poisons are lost, and others losing ground every day, for want of frequent communications: some of these act in a fluid state, and others in a state of vapour. The venereal poison requires contact, and possesses itself of those parts which are most frequently in contact. Some of the morbid poisons are confined to particular animals in their effects, as the cancer, while others may be communicated to different species of animals, as is the case with the hydrophobic poison. Some are peculiar to particular ages and parts, as the cancer; while others seem to perform their own cure; but this is, I believe, where the constitution ceases, after a time, to be affected by the poison, as in the small-pox, which is a property the constitution continues to retain, and is a very fortunate circumstance.

Of the poisons which I say act only locally, there are those which from their mode of existence in the part, and from situation, have their matter applied to other parts, which also become affected; but still these are only local effects, not affecting the system in general: of this kind is the poison or matter of the *itch*. This has been said to arise from animalcula. That animalcula may have got, by some means or other, into this matter, when exposed to the microscope, and that particles of matter may have been seen floating in this matter, which a lively imagination might suppose to be animalcula, is not improbable; but that these animalcula are necessary to the existence of this disease, I totally deny. I forget who it was was telling me a little while since that Dr. Teigh had lately shewn them, and that the Doctor did not shew these animalcula in the pustule, but that they were found on the skin near to the pustule, appearing, to the naked eye, a little black speck. This disease is, undoubtedly, a specific disease, and its cause a poison, which has many medicines capable of curing it; but these cannot always act in the same way. Mercury cures it; but one extraordinary circumstance, I think, with respect to mercury is, that friction with the ointment on the joints, &c. shall often fail, whilst the wearing a girdle smeared with mercury as often cures. Solution of sublimate also will cure; decoction of hellebore will, it is said, often cure; but the surest remedy is brimstone mixed with some unctuous matter. Brimstone taken internally until it reaches the skin, will also cure; but it must be taken a long time to do this, and in such a quantity as would often run off by stool: where this happens, opium should be joined with it.

CANCER.

As there is a tumour in the breast and other parts, as the testicle, &c. often found, which very much resembles in its appearance the true cancer, I would wish to distinguish these. That I call cancer which produces the following effects:—Tumefaction, of a circumscribed form, and possessing an almost stony hardness, with a drawing in of the skin, as if the cellular membrane underneath was destroyed, with an ulceration on the skin, or on the surface. It generally attacks the conglomerate glands, as the breasts

of women, uterus, external nose, pylorus, lips, testicles, &c. The other disease is what I call fungated ulcer, and is often produced by scrofula, when it attacks these parts. When the disorder is small and recent, it may be difficult, perhaps, to discover the difference ; but as the disease increases, it may be observed that, if cancer, it will, as it gets larger, get less circumscribed, taking in the surrounding parts by its disposition to produce continued sympathy and adhesive inflammation ; but if scrofula, the longer it exists, the more perfectly circumscribed will the tumour be, increasing not from the continued sympathy, but by interstitial addition of scrofulous matter. In the cancer, the skin over the tumour adheres to the tumour underneath generally, in consequence of the adhesive inflammation ; this being absent in scrofula, the skin is less fixed to the tumour. In the cancer, the nipple, for the same reason, gets connected with the tumour underneath, and in scrofula not. The tumour also in cancer becomes attached to the parts underneath. The pain in cancer is much more considerable than in the other. In cancer, those surrounding parts which take on disease by sympathy are, I believe, cancerous ; thus it is the skin takes on the disease and an ulcerated state. Now this is not so much the case in scrofula, for the reasons abovementioned ; the wound here appears to be inclining to heal, but seems as if prevented by the tumour underneath making its way outwards : nothing of this healing disposition appears in the cancerous skin. The increase of the part seems to be of the interstitial kind, produced by the extravasation of the coagulable lymph in consequence of the adhesive inflammation, which becomes afterwards cancerous solid. Cancer is capable of producing local effects only ; for if it were capable of tainting the constitution, so that the constitution should be generally affected, and be capable thereby of producing a local effect in another part, we should have stronger evidences of its presence ; and we should have them succeed a former cancer in any other part of the body, whereas they seldom or never appear in two distinct parts of the same person, but are frequently to be observed in different parts of the same compound part, as in the breast for instance. It will not be unusual to have a second appear in the neighbourhood of the first ; but this is neither a consequence of the operation for extirpation having been performed, nor of the constitution being tainted, but from some of the surrounding parts, which might be diseased, but so little so as not to be noticed at the time the other part was removed. I have several times, upon the removal of cancerous tumours of the breast, observed small tumours, or rather small dark spots, some as small as a pea ; now these had all the appearances, upon cutting into them, of cancerous tumours. These I carefully remove, not doubting but that, if they were left, they might in time become truly troublesome cancerous tumours, and, appearing some time after the former had been extirpated, might have induced a suspicion that the constitution had been tainted ; whereas this was the consequence only of those small glandular substances in the neighbourhood of the cancer being thus affected by sympathy. This effect may be produced, I believe, by remote as well as by continued sympathy ; and this has been the case, I believe, where I have seen a cancerous tumour shew itself at a little distance from the breast, about an inch below, where I could expect no direct communication with the original tumour. Besides consequent cancers appearing immediately in the neighbourhood of the original disease, we have them appearing in

the course of the lymphatics leading from that part, as in the arm-pit, when the original disease was in the breast; spermatic chord, when in the testicle, &c.: but this is still only another local effect, caused by the immediate application of cancerous matter by absorption to the lymphatic gland of that part. This absorption and consequent disease may be of the matter at two very different stages of the disease, and of two very different kinds of matter: thus it may take place whilst the tumour is only yet a scirrhus, as it is termed, before ulceration or even suppuration has taken place; or it may happen when ulceration or suppuration has taken place, and the real cancerous matter is formed. In the latter case it is the cancerous matter which is absorbed, but in the former it is, I believe, the extravasated coagulable lymph, the consequence of the adhesive inflammation by the continued sympathy, which is absorbed, and which possesses the same nature with the part with which it sympathizes, and which would have become cancerous solid. In a woman from whose breast I extirpated a large scirrhus yesterday, and where there was not the least degree of ulceration, the glands in the armpit were very much affected: so that there are three modes of the continuation of this disease; first, by continued sympathy; secondly, by remote sympathy; thirdly, by application of cancerous matter; and this case may be either, first, the true matter of cancerous suppuration and ulceration; or it may be, secondly, the extravasated coagulable lymph, which is to form the tumour itself; and cancers thus produced I call consequent.

That cancer produces only local effects, must appear from a comparative view of what takes place when poison does really affect the constitution. The first consequence of a poison being taken into the constitution is that of a fever being produced, which is from the specific universal irritation, but which is not necessarily the same in all: so far the poisons, when they enter the constitution, agree with one another. Cancer is similar to chancre, or the inflammation on the arm in the small-pox, being local; and, like these also, may be taken up by the lymphatics and inflame the lymphatic glands, forming a cancerous bubo, as the others may the venereal and small-pox bubo; but instead of bubo, I term it a local consequent cancer. Here the analogy ceases, for the small-pox and venereal matter, when thus absorbed, produce fever, and affect other parts: in the small-pox the effects produced are similar to the first cause; but in the venereal the effects are not similar to the first cause. In the absorption of the cancerous poison no fever is thereby produced, or any other symptom by which the constitution can be supposed to be tainted. The hectic fever which is generally an attendant on cancer, where it has teazed the constitution any length of time, is very different from the fever produced by the irritation of the system by the absorption of any of the forementioned specific poisons, and is exactly similar to that which is in or a consequence of the constitution being teazed by injury of almost any kind. In opposition to this idea of the locality of cancer, it has been observed, that cancer is generally preceded and accompanied by ill health in other respects, such as by rheumatic pains, &c.; but it must be observed, in answer to this, that the time of life at which cancers generally occur is that in which there is the greatest likelihood of such *complaints* also being found. The practical inference to be drawn from this opinion respecting the locality of

cancer is this, that the diseased part may be removed, although absorption has even taken place, as it is not a taint in the constitution that we have to fear any thing from. A scirrhus may continue for some years without any increase ; but when from any cause it takes on the increased action of inflammation, it, at the same time, seems to take on an increase of the diseased action : by this it is the size of the tumour is increased, and, as was before observed, is a consequence of continued sympathy; but when from the second mode of continuing the disease, i. e. by remote sympathy, it seems in general to be very slow in its diseased action, as the consequent cancers generally do not appear for years after the first disease : in the third mode of continuance the diseased action is also generally sluggish.

The parts most disposed to this disease seem to be those distinguishing the sexes, as the breasts, uterus, and the testicles. It seems to occur more often in the female than the male : this may be in consequence of the more frequent change in their constitutions. Cancer has been supposed to have been hereditary; but to this I cannot agree any further than respects the susceptibility for this disease. Are not they more frequent in some countries than others, from difference of climate? Thus, in the Friendly Islands, Captain Cook relates the women fight for prizes in the manner of our prize-fighters, and that their blows are chiefly aimed at the breasts. Now, from the medical men not having observed or mentioned a frequency of this disease among the inhabitants of that isle, it would appear not to be so easily produced as in this climate. Scirrhus is cancer without wound. Sometimes the first sign of cancer is the oozing of blood from the nipple. It sometimes begins with a small knot on the testicle, but oftener with a more general swelling. The tucking inwards of the skin round the wound gives an appearance by which I have often declared a cancer. The pain in the tumour is at first but trifling, but, as the increased diseased action comes on, the pain becomes pretty severe ; this severity of pain being according to the sensibility of the part affected. I have before observed, that it produces no alteration in the system in general, which can be attributed to its specific action in the constitution ; and now I mean to say, that it does not produce any symptoms peculiar to itself at all, or to its specific nature. Its progress to suppuration and ulceration is of two kinds ; the one when the skin is ulcerated externally, the skin partaking of the disease ; the other is where the scirrhus becomes encysted, forming a cancerous encysted tumour, the inside of this cyst being of a smooth surface, and the cyst is filled with a cancerous fluid, which is sometimes bloody, sometimes almost like serum, and at other times a curdled yellow fluid. These encysted tumours are not brought to the skin by the ulcerative process, the parts next the skin being absorbed in their ulcerated state, as in common abscesses ; but, like other encysted tumours, the intermediate parts between the cyst and the skin are taken up by the interstitial absorption.

Cure.—There has not hitherto been found, I believe, any cure for this disease. We have, indeed, *cancer-curers*, as they call themselves, enough, but there is a considerable difference between curing a disease and only removing the diseased part ; yet this last is all that is attempted by the different empirical nostrums : among these, Plunket's holds

the highest rank. This is an escharotic, with arsenic as its chief ingredient; but it is no new discovery, for Sennertus, who lived the Lord knows how long ago, mentions a Roderiguez and Flusius, who acquired considerable fame and fortune by such a composition. I was desired to meet Mr. Plunkett, to determine on the propriety of using his medicine in a particular case. I have no objection to meet anybody: it was the young one; the old one is dead, and might himself have died of a cancer, for what I know. I asked him what he proposed from his medicine? He said, "To cure the patient." Let me know what you mean by that: do you mean to alter the diseased state of the parts? or do you mean by your medicine to remove the parts themselves which are diseased? "He meant to destroy them," he replied. Well, then, that is nothing more than what I or any other surgeon can do with less pain to the patient. Poor Woollett, the engraver, died under one of these cancer-curers: he was under my care, when this person took him in his care. He had been a life-guardsman, I think, and had by some means got a never-failing receipt. I continued to call on Woollett as a friend, and received great accounts of the good effects; upon hearing which, I said, if the man would give me leave to watch regularly the appearance of the cancer, and see myself the good effects, and should be satisfied of its curing only that cancer (mind, not by destroying), I would exert all my little power to make him the richest man in the kingdom; but he would have nothing to do with me, and tortured poor Woollett for some considerable time, till at last I heard the sound testicle was gone, and he at length died. Arsenic has, I think, powers. One grain of arsenic to a quart of water makes a proper liquor for a poultice, which seems, I think, to lessen the cancerous disposition.

There are two modes of destroying the parts; first, by exciting greater action than the part can bear; and, secondly, by directly destroying it by chemical action.

Extirpation.—It is to be considered whether the part should be removed by caustic or the knife. There are many cases where a caustic could not be trusted, and where the knife must be used. The first consideration is as to the original cancer; whether its adhesion to other parts is such as will prevent the clear extirpation of it. A consequent consideration is to be sought for between the original disease and the source of circulation; if such are found, they require equal consideration with the original; nay, they ought to be examined with the utmost strictness, lest they should be found to extend beyond the reach of the knife. In performing the operation, leaving the least part of the cancer is equal to leaving the whole. The glands in the neck have become affected after those in the axilla. Scirrhi should be removed early, and the surgeon should be sure of going beyond the disease, and not be too saving of the surrounding parts. The tumour when removed should be examined, to ascertain whether any part had been so closely cut as to give a suspicion of any part of it being left, and then that part of the wound answering to that part must be examined. The consequent cancers generally come into action in about three or four months after the extirpation of the original. It is suprising to see how a young man, if he catches an idea which has any novelty, will write away on it; he will tell you wonders: thus, in a late treatise on cancers, we are told of their being removed, and the wound healed by the first intention. Now, perhaps,

this is the disease the least fit of any to allow of healing the wound by the first intention. I do not say it ought never to be done, for I have done it myself after extirpating a small and well-defined tumour, where I was certain of having entirely removed it. For lessening the pain, opium should be given in large doses. When cancer in the breast has lasted a considerable time, œdema is generally produced in that arm and side ; and I once, and only once, saw this œdema prior to the swellings of the glands in the axilla : this I could not account for. I once also saw a circumstance which puzzled me a little ;— a cancer in the groin succeeding a cancer in the testicle. I could not comprehend what connexion could possibly exist between the testicle and groin, as I could not suppose the lymphatics of the testicle passed through the glands in the groin ; but the recollection that in the original cancer the skin had been also affected, accounted for the consequent one

FUNGATED SORES.

I MEAN now to speak of what I call fungated sores, and which are often taken for cancers ; but they agree with cancer, I believe, in nothing but in being incurable. There is one very striking difference between these diseases ; the cancer appears to eat the parts away, whilst in this, new parts are added. This disease appears to me a specific one, and a well-marked disease. It seems to be common to every part of the body, while I believe cancer is not. The beginning of this disease is, I think, generally in the form of a tumour, either solid or encysted. As soon as the skin gives way, fungi arise, of a very dark colour : this rises so fast, that I believe we have no escharotic which can keep pace with it ; it yields a plentiful discharge of matter, but which does not appear to be a poison, as I never saw the lymphatics affected by it. This is the foot of a patient I had in St. George's Hospital : you see from the sole of the foot what a considerable quantity of this dark fungus arises. In this case there was no disease of the lymphatics proceeding from the foot, but, about a fortnight after the amputation, the stump swelled amazingly ; that however went off, and the patient mended very fast. Here you may observe the same kind of fungus arising from the testicle : here was no alteration in the spermatic chord. I stuck into the substance of this fungus troches of arsenic and wheat flour ; but these did not seem to produce any effect on it. It is this disease also which is the cause of that excessive enlargement of the penis that is generally supposed to be cancerous : this is generally harder than the common fungus of fungated ulcer. The surface of this fungus is in general tolerably smooth, and when cut into it seems to have somewhat both of a striated and radiated appearance in its substance. As there are no means yet discovered by which it can be made to take on a healing disposition, there is nothing left for us but a strict extirpation, so as to leave no part behind : if in the extremity, amputation is most proper. It is worthy of notice, that this disease kills with much less visible cause or mischief than cancer. The first case I saw of this, arising from accident, was in an ostler at the Dun Horse, in the Borough, who had received a kick from a horse on his fore arm. This broke into an ulcer of this fungated kind ; and his arm was amputated.

HÆMATOCELE TESTIS.

It is not the hæmatocele immediately consequent to accident which I mean to treat of here, but that kind which seems to be of a specific nature, being produced by diseased action, or a kind of secretion. It is often taken for, and removed as a cancerous testicle. In general the cyst is filled with extravasated blood, and at other times with a bloody serum : it does not appear to be a simple extravasation, as is the case in that from accident. When known, it may be treated as an hydrocele, and will, I believe, succeed as well. Now, when this was written, I thought this, but I do not know what to say to that now. I have seen cases since which have not succeeded ; and I am not quite convinced of the innocency of this kind. The coagulum of the blood extravasated will, in all these cases, be found adhering to the sides of the including cyst, and will require to be scooped out, otherwise, by defending the cyst, the necessary inflammation is prevented : the cyst is sometimes found very much thickened. I have seen cases which I think might with propriety be supposed to be mixed cases, and might be termed hæmato-hydrocele.

NOTES.

The properties common to all matter, and those peculiar to animal and vegetable matter.—P. 1.

The great variety of natural phenomena which are presented for our contemplation, the extreme minuteness of some and the vast magnitude of others, render it difficult to take a comprehensive and connected view of the whole: hence has arisen the necessity of studying the laws which regulate them under three distinct heads of natural science; namely, mechanical philosophy, chemical philosophy, and the philosophy of life or physiology. This division of the study of the laws of natural phenomena affords certainly great facility to their respective teachers and students; but it is attended with one disadvantage, namely, that the too exclusive study of one set of phenomena prevents us taking a view of the reciprocal relations and dependencies which exist throughout the beautiful and harmonious whole: yet this observation, it must be confessed, only applies to those who devote their entire attention either to mechanical or chemical philosophy; assuredly not to the physiologist, who cannot be unacquainted with those laws, in opposition to which vital phenomena chiefly manifest themselves.

Mechanical philosophy, or, as it has been termed, natural philosophy, contemplates the properties which are common to all matter, and the peculiar mechanical properties by which bodies are distinguished from each other, and hence classifies them. It also considers the power by which the integral, similar, or homogeneous particles of matter, are held together, with more or less cohesion, hence called cohesive attraction. It investigates that power, too, by which distinct masses of matter are kept in a certain degree of relationship and dependency on each other, together with the laws which regulate their motions in the great machine of the universe.

Chemical philosophy may be said to begin where mechanical philosophy ends. It has for its object to determine the nature of the elementary particles which enter into the composition of bodies, or, in other words, to examine their peculiar chemical properties, and to arrange them accordingly. It has for its object, too, the observance of that power by which these dissimilar or heterogeneous constituent particles are united together, termed chemical attraction; and also to ascertain the nature of those phenomena or changes which take place in the composition of natural bodies.

Philosophy of life, or physiology, contemplates an order of phenomena altogether different from the two former. They are influenced by laws which not only have the power of resisting for a certain period the laws which regulate inanimate matter, but of even acting upon other bodies in opposition to these laws.

It has been said, and with great truth, that, in the phenomena which natural philosophy and chemistry have for their consideration, there exist such an intimate relation between causes and effects, that the latter will admit of being numbered, weighed, or measured with mathematical precision: not so with the phenomena of life, where we often have much difficulty in tracing effects to their true causes, and of judging of causes by their effects; but, then, what a boundless field of interesting inquiry do they present to the acute and reflecting observer, and what a promise of a rich and plentiful harvest of important and valuable facts are held out to us, when it is properly cultivated!

No man worked harder in this field of inquiry, or with more sterling advantage, than did Mr. Hunter; but he left much to be performed by those labourers, who, inspired with the same ardour as himself, were to follow him.

It was the study of the phenomena of life in every possible modification of structure in which they manifested themselves, and under circumstances both of health and disease, which constituted almost the whole business of Mr. Hunter's useful life; and we find him to have been in possession of the most extensive knowledge

of natural history in the most comprehensive sense of the word; and to be fully acquainted with the laws of inorganic existence; readily acknowledging their secondary aid in some of the most important functions of life. It was this comprehensive view which he took of the whole scheme of nature, that, no doubt, induced him to commence even a course of lectures on surgery by considering the properties common to all matter.

Matter, or substance of which bodies are composed, is, in respect of its essence, as much unknown to us as that of mind. All that we know of the former relates to the various properties or qualities which present themselves to our senses, as we do of the latter by sensation, thought, and volition.

Extension, impenetrability, form or figure, inertia, and attraction, are the properties common to all matter, the bare enumeration of which will be sufficient for our present purpose; for it is the peculiar properties, by which bodies are distinguished from each other, with which we are more immediately concerned. At our first step on the inquiry after these properties, we shall be forcibly struck with the great difference which exists between two extensive classes of bodies, namely, those which have no definite structure, or mode of increase or growth, and every particle of which, be it ever so small, has an existence independent of the whole; and those which have a determinate structure, a mode of growth within themselves, and where every part is dependent for its existence upon the whole: the former are termed inorganic, and the latter organic bodies. Organic bodies, whilst still endowed with that principle of life which has built them up, are remarkably distinguished by their properties from inorganic bodies, but by none so constant, perhaps, as the power of resisting decomposition. Even when organic bodies have been recently deprived of life, they still retain for a longer or shorter period, according to the circumstances under which they are placed, their peculiar definite structure, and will be found essentially to consist of solids and fluids, which is a property no inorganic body possesses. As they gradually lose all trace of these characteristics, they are only to be distinguished by the chemical changes which take place among their constituent elements in their return to the inorganic matter from which they originally sprung. The following quotation of a passage from Mr. Allen's translation of Baron Cuvier's introduction to the study of the animal economy may not be considered irrelevant:—"Take, for an example, the female form in the fulness of youth and health; observe the rounded and voluptuous swell of the limbs; that graceful ease in motion; that balmy warmth; those cheeks tinged with the roses of health; those eyes beaming with love or sparkling with intelligence; that countenance enlivened by wit or animated by feeling: every thing combined to form an object of fascination. A single instant suffices to dispel the charm: often, without an apparent cause, sensation and motion cease at once; the body loses its warmth; the muscles become flaccid, and disclose the prominent angles of the bones; the eyes lose their lustre; the lips and cheeks become livid. These are but preludes to changes more hideous. The colour passes successively to a blue, a green, a black; the flesh absorbs moisture; and while one part of it escapes in pestilential exhalations, the remaining part falls down into a putrid liquid mass. In a short time no part of the body remains but a few earthy and saline principles; its other elements being dispersed through air, or carried off by water, to form new combinations."

In concluding this note, it will be interesting, and not out of place, to inquire how far some of the peculiar properties, which serve to distinguish inorganic bodies from each other, may assist in the performance of the functions of life; and, upon inquiry, I think we shall be borne out in saying, that wherever nature can employ physical agents in living bodies she universally does, and it would appear to be for the two following reasons: first, because their action is much more simple and constant, and consequently not subject to those causes of disturbance to which purely vital actions are exposed; and, secondly, because their exercise is not followed by exhaustion.

The first of these properties which we will advert to is, elasticity. It is not necessary that we should here inquire how far this property is under the influence of life, and consequently modified by health and disease; it is enough for our present purpose to determine that the effects are caused by elasticity.

Independently of the great advantage arising to the animal frame, more particularly in vertebrated animals, from the elasticity of cartilage; from that of the hoof and the elastic ligament of the neck of some animals, we shall also find that the certainty of our existence from one hour to the next is greatly increased by this property of elasticity, as it is upon it that the function of a very important organ, the epiglottis, exclusively depends: were it otherwise, and left to the capricious action of a muscle, our lives would be in a constant state of jeopardy.

Although the primary cause and ultimate effect of the circulation of the blood is doubtless purely vital, yet the intermediate part performed by the arterial system may be now considered as depending entirely upon its elasticity, which may be explained in the following manner:—The blood being propelled by the systole of the ventricles into the arterial tubes, these become dilated, and at the same time lengthened. During the diastole of the ventricles the arteries recover their former state, and in the act of so doing propel the blood into the veins. May not this act of shortening occasion the apex of the heart to strike against the ribs? It is unnecessary to dwell upon that elastic power which arises from the aqueous vapours secreted into the universally connecting cellular membrane of the body, by which the free and easy play of the muscles, and the functions of other organs, are locally much assisted, and by which pain and injury from mechanical violence are considerably diminished; and it may not be, perhaps, going too far, to say, upon which the healthful play of the animal functions, and even of the mind itself, through the instrumentality of the brain, very much depends. What, it may be said, is the brain elastic? Yes, otherwise it would receive too great a shock from the momentum of the blood, notwithstanding all the other contrivances to guard against it. But what, again may it be said, avails its elasticity, completely filling, as it does, a firm bony cavity? May not this be counteracted by the elasticity of the halitus secreted within the ventricles? The ascent of the sap in plants also may be greatly assisted by the elasticity of their conical bundles of spiral fibrillæ, or vessels, as they are termed by botanists, and it may likewise contribute to its lateral diffusion. Though it may be considered as a digression in this place, it may not be uninteresting to notice, by the way, that though these actions appear to be both going on at the same time, yet that a certain balance is preserved between them under the influence of the seasons. In the spring and summer the balance is in favour of the ascent of the sap and upward growth of the plant; in the autumn and the early part of winter, the lateral diffusion has the advantage, and consequently the growth in circumference.

There is another property opposed to this with which some parts are endowed, and upon which their chief function depends, namely, that of being firm and unyielding. The osseous fabric of the higher order of animals is not only here alluded to, but there are certain textures to bind some parts together; to restrain others in their action, and even to form fixed points for the insertion of muscles, which do not possess any elastic power, and which, when under disease, require the strictest attention.

The last property which the medical student would do well always to bear in mind, is that of peculiarity of form or figure, not only because substances educed from organic bodies assume, under certain circumstances, symmetrical forms which inorganic substances do under the same circumstances; or that many parts of animals are likened to geometrical figures, and hence named, but (not to dwell upon the palpable mathematical accuracy by which the form of the different parts constituting the eye and the ear contribute to determine their functions), wherever extent of surface combined with strength and lightness is required; wherever cavities are necessary to contain and defend organs, or to stow away substances for future provision, at the least expense of space; wherever fixedness of position, or different degrees of extent of motion, are to be obtained; and, lastly, wherever the momentum of the blood is to be increased in some parts or diminished in others, thus preserving the balance of the circulation; we shall find that all these circumstances are provided for by forms constructed upon the most scrupulous attention to those statical and mechanical principles which the ingenuity of man has hitherto been able to discover.

The above observations must be considered as giving but a very faint outline of the country over which the medical student has to travel; but which, if he carefully fills up as he proceeds, ever keeping the example of Mr. Hunter in view, and should afterwards wander far into the interminable path of speculation, he will find much to fall back upon and rest satisfied with on his return.

Life.—P. 2.

If Mr. Hunter displayed more excellence as a physiologist in one thing than another, it was the manner in which he pursued the study of the phenomena presented by living beings. Disregarding all speculations respecting the abstract nature of life, or in what its real essence consisted, he diligently examined every structure which exhibited the least indication of its existence, or its effects, both in its active and passive state. In allusion to this mode of studying physiology, Dr. Prout very forcibly remarks, in his work on the Application of Chemistry

to Physiology, that "The true and legitimate object of inquiry for the physiologist ought to be, not what the vital principle is, but what it does; just as the laws and effects of gravitation are legitimate objects of inquiry, though we know nothing, and probably never shall know any thing, of the principle of gravitation itself." Although we shall probably be for ever in ignorance respecting the nature or essence of life, it is very questionable whether the search after it, like that for a hidden treasure, has not, in exploring every habitation in which there is the least manifestation of its presence, been more profitable than if we had early been in actual possession of the secret. Thus the physiologist, who attentively studies the signs by which life manifests itself, and examines minutely every structure in which its works are displayed, acquires more real and useful information than he who vainly endeavours, in his closet, to form correct notions of that essence which is far beyond the reach of our limited faculties. Physiology being one of those uncertain sciences in which it is often difficult to refer effects to their true causes, and to trace causes to their true effects, that man has much the advantage of his brother labourers in the field of inquiry, who, with a zeal to study physiology for its own sake, and who, being previously prepared by education and habits of application, has time and opportunities afforded him of taking a comprehensive and comparative view of the structure, relative situation, and connexion of the different parts constituting organized beings, from the lowest order of plants, through every link of the chain, to the complicated structure of man,—who also examines closely the phenomena which all living beings present, and the order in which those phenomena are developed, and who is bold enough to interrogate Nature himself, and faithfully record her responses. Added to these qualifications, his knowledge of the more certain laws which regulate inanimate matter, and his application of them to explain many parts of the animal and vegetable economy, enable him to carry his researches to the very threshold of that portal whereon is written, in legible characters, "Thus far, and no farther," and there "to bend in submissive adoration, acknowledging a wisdom he cannot fathom, and a power which he cannot comprehend." Such a man is the first to acknowledge the narrow limits of his own faculties; and, from his habits of close observation and reasoning, we can easily discover that he has acquired the scientific tact of separating the pure metal of well grounded theory from the dross of hypothesis. Such a man was Mr. Hunter, to whose opinions we ought always to give our tacit assent, until we have, by pursuing the same path of inquiry ourselves, either come to the same or to different conclusions. The road to truth is now laid open to us all; the hedgerows of superstition, slavery, and ignorance, which compelled men to pursue one narrow, dark, and much-trodden track, have long since yielded to the bill-hook of the great pioneer in science, our illustrious countryman Francis Bacon, who, not content only with liberating men's minds from the state of bondage in which they had long been held, supplied them with a sure guide to direct their future investigations of nature and their inquiry after truth.

Life may with great propriety be considered under two states, i. e. in its passive state in which it exists in the eggs of animals, and in the seeds and bulbs of vegetables, in which it is only known to be present by the power which they possess of resisting decomposition, and of preserving a certain degree of temperature; and in its more active state, in which its phenomena are at once evident to the senses. In the former state it may exist for any indefinite period, and, however long it may have remained in this state, does not seem, in general, to suffer any decrease of its energy. Remarkable instances of seeds and bulbs having retained this principle for a very considerable number of years are upon record. The latter has a more definite period of existence, and is characterized by passing through a regular succession of stages, namely, of increase, perfection, and decline. Active life has been divided by the illustrious and ever-to-be-lamented Bichat into animal and organic life; the former exclusively belonging to animals, and the latter belonging in common to animals and vegetables. The vegetable sustains towards exterior bodies only the relation of nutrition, which constitutes interior life; the animal exists by virtue of its numerous relations with surrounding bodies, and enjoys, therefore, allied to the interior, an exterior life. Hence the animal possesses two distinct classes of functions. By the first it transforms into its proper substance the molecules of surrounding bodies, and rejects them when they are become heterogeneous. By the second it sees and perceives, reflects, moves, and communicates. By the former class it is fixed to the soil whence it imbibes existence; by the latter, it is rendered an inhabitant of the world. The assemblage of the first class of functions constitutes the organic, and that of the second the animal life.

Animal life is subdivided into two orders of functions. The first order is that which communicates the impressions of the senses to the brain; the second, that which communicates the impressions of the brain to the

organs of locomotion, voice, &c. The first comprehends the action of exterior bodies upon the animal, or sensation; the second, the reaction of the animal upon them, or volition.

Organic life is subdivided into two orders of functions. The first, that of composition, resulting from digestion, circulation, respiration, and nutrition. The second, that of decomposition, resulting from absorption, circulation, exhalation, and secretion. The first constitutes assimilation and increment; the second, dis-assimilation and decrement. Thus the sanguineous system is the centre of the organic, as the cerebral of the animal life.

Besides this division of life into animal and organic, can we not recognise another distinct manifestation of the living principle, more primary and simple in its action than the two former, which might be termed *formative life?* As upon a formative action must depend the building up of the structures required for carrying on the respective animal and organic functions, and of those for the reproduction of the species, must it not have had a prior and independent existence, and an origin immediately out of passive life? If it were asked, to what material form does this formative life belong? it might be said, exclusively to the blood (or to any fluid in animals performing an analogous office), and to the sap of vegetables. For notwithstanding the strong association which exists in animals between the formative action of the blood itself and the sentient extremities of nerves, by which the precise action is determined and regulated, and by which a sympathetic influence is kept up between every part in reference to the well-being of the whole, this formative life must have had existence prior to this association having been established.

This combination of sentient and formative action appears to be necessary to animal existence, especially to that of the more complicated animals, where there are so many checks and counterbalances, that it is necessary they should be kept in close association. Vegetables may have something analogous to this regulating nervous principle, but the necessity of it in them is not so apparent; for the functions of plants appear to be much more under the influence of the external chemical agencies of air, moisture, heat, light, and, perhaps, electricity, than those of animals are. It would appear, that it is upon the influence of these powerful agents upon the formative life of the sap that the vegetative and reproductive powers of the plant depend. The different organs in which these powers manifest themselves must be considered only as secondary mechanical agents. Whether those substances which are called secretions of plants are really analogous to animal secretions, may be difficult to determine; but perhaps we may be nearer the truth when we say, that they are rather the result of a successive series of elaborations of their peculiar and respective saps, under the increasing influence of the agents above-mentioned. But whether this is the case or not, it does not appear that any other regulating principle is required except that of the formative life of the sap itself. Besides, in plants, may be traced a regular succession of metamorphoses from the most simple form of an organ to that of the most complicated which they may possess, and this in the same individual plant; consequently nothing like sympathetic connexion is required. If the independent existence of this formative life is granted, and that its residence is in the blood, then must we rob Bichat of two of his organic functions, namely, of nutrition and secretion, and must also deprive the capillary vessels of any share in these functions, except that of conveying the blood to its ultimate place of destination in a state of extreme mechanical division, the degree of which may be different in different organs.

The idea of the distinct existence of a formative life is corroborated by the following sentence in the excellent work entitled, "Outlines of Physiology and Pathology," by the learned Professor Alison:—"It appears, on the whole, beyond doubt, that the phenomena of Secretion and Nutrition are inexplicable by, and inconsistent with, any principles that can be deduced from the observation of dead matter, or *of other functions of the living body*. At the same time, it is obvious that they do not take place fortuitously, or at random, but according to fixed laws. We refer them, therefore, to a vital property, known to us only by its effects, and our notion of which is, as yet, necessarily vague and imperfect;—which modifies chemical affinities in the living body;—varying in different parts of the body, and causing these to be differently effected by, and produce different effects on, the blood which pervades them; influencing likewise, no doubt, the chemical nature and relations of the blood itself."

Z

Life of the blood.—P. 4.

Though there may be a few who still think that the blood is little better than salted porridge to stimulate and nourish the solids, yet the generality of physiologists of the present day are of opinion, with Mr. Hunter, that the blood is alive, and that it possesses as much independent life as any of the solids; and when men begin to think alike, they may fairly be presumed to think aright.

As every part of the living body is formed and supported, and receives its respective share of life from the blood, it may not be considered as presuming too much to say, that it may possess the very essence of life; and that all secreted fluids whilst they are retained in the body, and, perhaps, for a short time after they are ejected, are also alive. This is surely the case with the gastric juice, semen, and coagulated lymph, thrown out in inflammation. Upon this life of the blood does its formative action depend, which seems chiefly to consist in its power of separating, in the extreme vessels, the parts more essential to the formation and support of the body, from the red globules, and from parts which are to be rejected as useless, and which, if retained, would prove injurious.

What then, it may be said, is the use of the red globules? Perhaps, to preserve the blood in a state of greater fluidity in the larger vessels, by keeping the particles of the coagulating lymph more apart; and also to increase the momentum of the blood in consequence of their greater specific gravity.

Absorption.—P. 9.

This is one of the functions of the animal body most difficult of explanation. However ingenious Mr. Hunter's notion was respecting the absorbents being in possession of different kinds of mouths, yet it is difficult of application to explain the whole of the phenomenon. One difficulty, however may be got rid of, namely, that by which the absorbents were supposed to take up solid parts; for it is no more to be supposed that the solids are absorbed, as solids, than that solid matter is to be found in the capillary vessels just before its deposition. Absorption may be compared to digestion, by which solids are converted into fluids by a chemico-vital power of decomposition, whereas the deposition of solids from the blood may be considered as a chemico-vital power of composition, by which fluids are converted into solids. Does the internal surface of the absorbent secrete a fluid similar to the gastric juice? Capillary attraction cannot be supposed sufficient to account for the passage of the absorbed fluid into the blood; we must therefore look for some more efficient power, either in the absorbents themselves, or in something connected with the motion of the blood in the veins: the latter is most probable, as experience points out to us an intimate connexion between absorption and the degree of venous congestion.

Sympathy.—P. 20.

Mr. Hunter has truly remarked, that the knowledge of the various sympathetic connexions existing between the different parts of the body, both in health and disease, constitutes a very important principle of surgery, as upon it depends the power of ascertaining the real seat of disease. Mr. Hunter left much for others to perform in this field of inquiry, and to no one are we more indebted for the advancement of our knowledge of this principle than to the late Mr. Abernethy, who has conferred a lasting obligation on surgical science, by his work on the Constitutional Origin and Treatment of Local Diseases. But even the views of this excellent surgeon appear not to have been sufficiently comprehensive, as he seems to have directed his attention too exclusively to the disordered state of the chylopoetic organs as a first cause, and consequently too little regarding the powerful influences of other important functions of the body, and even of the mind itself. Before Mr. Abernethy's time, surgeons too exclusively directed their attention to the local treatment of disease; now they too often err, by paying too little regard to it. An important practical distinction may be drawn between those morbid sympathies which are of sensation only, and those in which there is morbid action also induced, whose treatment, to be judicious, should go closely hand in hand with that of the original disease.

Specific.—P. 32.

As this term frequently occurs in this work, it will be well to give Mr. Hunter's own explanation of it, contained in a note in his work on the Blood, &c.:—"In the course of this work I very often make use of the word species or specific, by which I only mean peculiarities or distinctions; and probably the term is much too loose in its application; for as we are not entirely acquainted with the specific differences in disease, we may call that a species which more properly ranks as a genus, class, &c. Of morbid poisons we can make a correct arrangement; but, with regard to disease arising from peculiarities in the constitution, we have no such absolute guides."

Wrong action. Too great action. Too little action.—Pp. 36, 37.

The consideration of these actions has been placed in the preceding order, because it is that in which they appear naturally to take place; for it is difficult to suppose that the actions of a part can be morbidly increased, without being preceded or at least accompanied by wrong action. It may not be uninteresting to follow up this idea. We will first suppose a part previously healthy and vigorous to receive some mechanical violence, by which its structure is impaired, giving rise to an interruption in its sentient and formative actions. At first, perhaps, the secretions of the part are not only disturbed, but diminished; hence the whole of the blood sent to the part is not got rid of, and therefore accumulates in the vessels faster than the veins can convey it away; but through the impression made on the sentient principle, both it and the formative action of the blood is increased with a view to a restoration of the healthy action of the part. The natural secretion of the part may at first be still more deranged and diminished, and consequently a greater accumulation of blood takes place, but it will soon afterwards be restored, and perhaps increased. This unloads the distended vessels; the veins no longer receive more blood than they can convey back easily to the heart: hence a restoration of the balance of the circulation, and a termination by what is called resolution, and this may have taken place without the system having taken any share in it. But, say, that the injury is more severe than the part itself can restore; intelligence is then sent to the citadel by the sentient principle, and all the associated powers are called into action: a general disturbance of the system takes place; the heart is roused to more powerful action, and this, with the increased vital action of the blood itself, may prove just sufficient to restore the healthy action of the part, as in the former case; or they may go a step farther, and establish another secretion or deposition of the coagulating lymph of the blood, which may be sufficient to restore the balance of circulation by relieving the overcharged vessels. This coagulating lymph may afterwards either be absorbed, or may become so amalgamated, as it were, with the part itself, by becoming organized, as to impair, if not to destroy, the function of the part affected. Should this effusion of lymph not prove sufficient to unload the gorged vessels, and to repair the injury, then another formative action is set up, and the texture of the blood seems to be broken down into a cream-coloured matter, termed pus, which is deposited into a circumscribed cavity formed by the coagulated lymph previouly deposited. This pus is either afterwards absorbed, or brought to the surface by ulceration, which, as soon as the matter is discharged, is quickly repaired by the powers of the part. *Here then we have had wrong action followed by increased action, but not too great to lead it to a healthy termination.* But we will now suppose the injury to be so great, or the actions of the part, or of the system, not sufficiently under controul, and the blood to have been so long congested in the vessels, and the sentient principle to be so exhausted, that pus cannot be formed. The blood becoming now stagnant in the vessels dies, and with it the sentient principle; and hence the part is said to be mortified. *Here it may be said, there has been too great action for the power of the part to support.* Let us now view these effects in an opposite state of the part or of the constitution. Here the cause may be either external or internal, or both combined; for the blood itself may not be so well constituted, or it may not be propelled with sufficient force (either from want of vigour of the muscular power of the heart, or from a deficiency of the red globules of the blood, whereby its specific gravity is diminished) to preserve the healthy action of the part. Wrong action takes place; the blood deposits a substance unfit to become organized, and the absorbents either refuse to take it up, or their decomposing power is so weakened, as to deprive them of the power of so doing, and hence it accumulates in the structure of the part affected, forming a circumscribed indolent tumour, which, whether it is a gland so changed, or a por-

tion of the cellular tissue, it is generally formed near to the surface of the body. If in this stage corrective and invigorative means should be employed, with attention to preserve an equable temperature of the body, this may be removed; but if these means are neglected, increased action comes on, and slowly advances to imperfect suppuration. The pus, which is as badly constituted as the blood from which it is formed, is slowly brought to the surface and discharged by ulceration, which admits of very tardy reparation, there being now *too little action*. This may be considered as a tolerably correct picture of the scrofulous abscess and ulcer.

Let us now suppose this wrong action to go on for a considerable time, but in some internal part of the body, where the temperature is more equable, being productive of the same deposition of unhealthy matter which the absorbents refuse to remove, except, indeed, the more fluid part, and the surrounding parts appearing undisturbed by its presence: thus tubercles may be said to be formed*. These continue for a longer or shorter time, either stationary or gradually increasing, when one of three changes may take place in them,—either the constitution and formative action of the blood may be so improved, and the system so invigorated, that no more such matter is secreted, and what has been deposited may be taken up by the absorbents; or the surrounding parts may become sensible of them, as they would of extraneous bodies, and set about removing them by suppuration and ulceration; or this unkindly matter may, perhaps, prove the nidus for the growth of hydatids, the rudiments of which may have been deposited with it, which, as they enlarge, may destroy all trace of the tubercle in which they were formed.

Scirrhous and other tumours may be adduced as additional instances of the effects of wrong actions; and when a hollow glandular apparatus called a follicle, or the bulb of a hair, becomes the seat of these wrong actions, then we may have formed what is termed an encysted tumour.

Morbid changes of countenance.—P. 41.

Notwithstanding that our diagnosis and prognosis of disease should be drawn from collective rather than from individual symptoms, however strongly marked, or however alarming or encouraging they may appear separately, yet there is one symptom which, even, if taken singly, is a very certain guide to the experienced eye; namely, the change which the countenance undergoes in different diseases, and in the different stages of the same disease. A knowledge of this can only be acquired by experience; no language can impart it to another; therefore it ought to be the business of the medical student to put himself, as early as possible, in possession of this desirable talent, by carefully watching and noting in his mind the different expressions of the countenance under disease. A portrait painter could not be more usefully employed than in delineating, in the wards of an hospital, the features of the countenance under diseases in which a strongly marked difference exists: thus we might have expressed, on canvas, in addition to the facies Hippocratica, a facies rheumatica, tetanica, hydrophobica, syphilitica†, and those expressive of the different inflammatory and congestive affections of the respiratory organs, and of the different types and stages of febrile diseases.

Morbid variations of the pulse.—P. 41.

Although, upon the principle of the arteries acting by elasticity alone, it may appear, at first sight, difficult to account for the morbid variations of the pulse, yet this difficulty may be much removed when we consider that the chief deviations of the pulse from a healthy state depend either upon the action of the heart alone, or upon it, combined with the degree of resistance that is offered in the capillaries. And, again, we must agree with the late Dr. Parry, that this elasticity of the arteries is modified by life, and consequently influenced by

* The notion that the want of power in the heart has a great share in the production of the scrofulous abscess and tubercle, is greatly strengthened by the following observation, extracted from the Inaugural Dissertation of Dr. Robert Dickson on Pthisis Pulmonalis, who says, on the authority of Portal and Lieutaud, when on the subject of the post-mortem appearances, "Cor sæpe mollitur, interdum minuitur, sed haud infrequenter, præsertim latere dextro, dilatatur: arteria pulmonalis quoque sæpe dilatatur. Cor aliquando adipe obrutum est."

† The Annotator has frequently heard the venerable father of British surgery, Sir William Blizard, determine the nature of a disease to be syphilitic, merely from the expression of the countenance, before he had the opportunity of judging from any other symptom.

health and disease; thus we may have a hard, or a soft pulse, depending upon the state of the formative action of the blood conveyed to the arterial structure by the vasa vasorum, upon the same principle that the surface of the body conveys to the touch a difference in health and disease.

Bleeding.—P. 65.

Such is the importance of this as a remedial agent, capable of effecting so much good when timely and judiciously employed, and, on the other hand, of proving so highly injurious when due discrimination in its adoption is not attended to, that it may be justly said, that whenever we have determined all the morbid conditions of the body to which it is applicable, the extent to which it can be carried and the best mode of accomplishing it in each individual case, we shall have arrived at somewhat like perfection in our practice. So various and so opposite are the indications which it is calculated to fulfil under the varied circumstances of disease, that there is hardly an article of the materia medica whose action it is not capable of imitating under some circumstance or other: thus it may depress the nervous energy in one case, and invigorate it in another; diminish the action of the heart under some circumstances, and increase it under others; excite vomiting and purging in some cases, and check vomiting and diarrhœa in others; restore the balance of the circulation at one time, and disturb it at another: indeed, there is only one medicine whose action it cannot imitate, and that is mercury.

It is upon the judicious employment of these powerful agents, namely, bloodletting and mercury, that our chief curative intentions depend; but which may be very properly compared to two-edged swords, requiring much management in their wielding. Other remedies must be considered either as inferior in the degree of their curative effects, or as more or less powerful adjuvants. But, powerful as these two agents are, they must ever be employed with a due regard and reference to that power which is constantly exerting itself to preserve health, and to restore it, when disturbed, namely, the Vis Conservatrix and Medicatrix Naturæ, to which all our remedies should be considered as more or less powerful auxiliaries, than as possessing any curative powers themselves.

The circumstance which has led to the omission, or to the too sparing use of bloodletting, has been the great dread of increasing the debility, which is the natural consequence of the attack of all diseases, but more especially of those serious forms of disease requiring the most active depletory treatment, in which the loss of strength is much more apparent than real. The circumstance, on the other hand, which has conduced to the too lavish expenditure of the blood, has been the belief that nothing but bloodletting could cure an inflammatory disease, consequently it has been carried to a great extent whilst any pain or increased action of the heart existed; the latter being often kept up by the depletory means which were intended to quell it. The following just remark, which experience fully confirms, was taken from the Annotator's common-place book, which, contrary to his custom, he had extracted, without attaching to it either the name of the author or the title of the work:—"Again and again have I seen a practitioner, by the extent to which he has pushed his depletory measures in the treatment of an acute disease, produce this hurry of the circulation, and then, mistaking this effect of his treatment for the index of continuing inflammation, persist in the same measures, and add fuel to the flame; thus proving the evil consequence of depending too much upon a single symptom to guide our practice."

Power and action.—P. 151.

It would be well if we could always trace an analogy between vital and physical agents, as we should then be much better able to compute the effects of the former. This to a certain extent can be accomplished in those actions which exclusively belong to animal life, viz., voluntary muscular action, in which we can measure the power of the action by the resistance which is overcome, but not so with those belonging to organic life, for here we shall find that the power is not increased in proportion to the degree of action, but most commonly the reverse. The power which is here meant, then, is not to be considered as denoted by the force or frequency of action, but rather as a governing or restraining power, constantly exerting itself to preserve a degree of action

consistent with the healthy function of a part, or of the constitution. In a physical sense, power is always supposed to be antecedent to and necessary for the existence of action, which action or motion is regulated by certain fixed laws; but in the living body we find that power and action are connected with and materially depending upon the existence of each other, the knowledge of which, in a practical point of view, is of the greatest importance. If the actions of life be excited beyond that which is natural and healthy, the power of maintaining that action will soon be worn out; but if the action is moderate and regular, the power of the system will be preserved undisturbed until it arrives at that period which the Great Maker of the machine originally destined for its destruction. If the action becomes preternaturally diminished, in that proportion will a diminution of power take place; therefore to increase power we must increase action: but this must be done very cautiously; for when the powers of the system, or of a part, have been diminished, the action which follows is so prone to go into excess upon the application of the slightest stimulus, that it may still further so exhaust the power as to occasion the destruction either of the life of the whole system, or of the part. It should therefore be set down as a rule never to be departed from, that in all cases of direct debility never to increase the action suddenly by the application of strong stimuli at first, lest there should not exist sufficient power to lead it to a healthy termination.

According to this view of the power and action of living bodies, we cannot with any propriety say, that in one disease there exists both increase of power and action, and in another that there is increase of action, but diminution of power; for in all cases where the actions of the system, or of a part, are morbidly increased, there must exist a diminution of that power by which the actions are restrained. We may say, and with great truth, that there exists more power in one case than in another. But simple and easy of comprehension as this may be, and however ready of application it may appear in practice, yet such is the great variety of organs in the complicated system of man, both in number and function, and such are their numerous sympathies, that it requires often very nice discrimination to determine the degree of power which the system, or a part, possesses, and consequently to apportion our remedial agents accordingly. In some cases the loss of power is much more apparent than real, especially when organs, which are highly gifted with vitality, are injured, or morbidly affected; or where parts are under inflammation which possess a very low degree of vitality, but whose chief function consists in the physical property of great unyieldingness, such as thecæ, aponeuroses, &c. On the other hand, there are cases in which there is much apparent power, but in which very little exists.

The power of the constitution is too often judged of by the external manifestation of robust health, but this is very deceptive. By the term constitution, we are to understand that combination of the functions of animal, organic, and formative life, upon which the harmony of the whole depends. A good or bad constitution is in proportion to the degree of power which exists of preserving this harmony.

Carbuncle.—P. 154.

Two circumstances appear mainly to have contributed to retard the progress of medicine; the first has been the notion which for a long time cramped the energies of practitioners, that debility was rather the cause than the natural consequence of disease, which led them to mistake the mere oppression of the powers of life for the real loss of strength; the other circumstance has been the endeavour to find out some short cut to the treatment of diseases, by affixing to them a specific nature, and consequently to be cured by a specific remedy, which, like the philosopher's stone, medical men were constantly in search after. Though many examples might be brought forward of the baneful influence of these two opinions, the consideration of carbuncle will serve for all. Before Mr. Hunter's time, this disease was treated as one of great debility, and a plan of treatment was accordingly adopted, which was the worst that could possibly be devised, namely, that of giving bark and wine, and hardly allowing the evacuation from the system which might arise from the operation of a purgative. The engineer would have just as much reason on his side, were he to attempt to put a machine in good action which had been for some time deranged in every part, by merely increasing his power.

Mr. Hunter, seeing the bad success of this mode of treatment, and finding the system not only harassed by the disease, but also by the remedies, conceived that there might be something specific in the nature of this disease, and, accordingly, we find him humorously going through the articles of the materia medica, according

to the letters of the alphabet, in search of a specific. Now it must be confessed, that though he did not find it, he did a great deal of negative good; that is, he suffered Nature to take her own course. And now let us examine what this course is. We shall find that those who are most prone to this disease are those who have passed the middle period of life, and who, according to a French expression, have been bon vivants. In the earlier periods of their lives the formative actions of nutrition and secretion have gone on abundantly, keeping pace with the ingesta, or at least stowing the superfluous quantity away in the form of fat. This forced state cannot last long: the stomach gets tired of having so much to do; it loaths plain food; it must be tempted by something savoury or relishing, and induced to digest it, by a spirituous potation. All the organs intimately connected with the stomach become deranged; the heart becomes oppressed with too much blood, either positively or relatively, with regard to its power; the blood itself is altered in its condition, and sent in this state to the brain, deranging still more its function, already impaired by its sympathy with the stomach. The blood, thus diseased, has its own formative action deranged; secretion and nutrition are badly performed, which tend still further to increase the quantity and to deteriorate the quality of the blood: in fact, the patient, to make use of common expressions, as far as his stomach and liver are concerned, is dyspeptic and bilious; with regard to his nervous and muscular system, he is nervous, irritable, and weak; and, as respects his heart and his blood, he may be said to be in a state of phlogistic diathesis, or that state which is ready to go into excessive action upon the least exciting cause. Before we proceed to the consideration of carbuncle, let us imagine such a person receiving a severe bodily injury; say a compound fracture of a limb. What takes place? At first the actions of the part and of the system will be excessive, from the restraining power of the system being impaired; but still there may be sufficient to bring it to a favourable termination if the case should meet with judicious treatment. Leeches are applied, in appropriate numbers, to the part, to which also the soothing influence of moderate heat with moisture is imparted, rendered still more soothing, perhaps, by the poppy; the bowels are unloaded of their feculent contents; all the secretions are attended to; and that the means employed for their increase or amendment should not ruffle too much the system, or the organ to which they are directed, a moderate quantity of opium, or any other narcotic, is combined with them. All this time the patient is allowed cooling diluents, and weak broths. We will now suppose, that suppuration is fully established, and the system and the part to become calm. Though we have now real debility, a patient will sometimes say, "I never felt better in my life." Now a more generous diet is allowed, and mild tonics administered, and the patient is restored to a state of health which he may not have enjoyed for many years.

The above observations may appear to be a digression from the subject, but they prepare us for the consideration of the manner in which Nature herself sets about to relieve this oppressed state of system. Animate as well as inanimate machines require safety-valves; but animate have this advantage over inanimate machines, that, where the original or natural are closed, they can open artificial ones; and it will be found that, in the production of a carbuncle, Nature is establishing a preternatural safety-valve to unload the oppressed system, and she seems to do this upon the same principle that a surgeon would make an issue or a seton: the only difference is, that Nature accomplishes it upon a much larger scale. What object have we in view in making an issue or introducing a seton?—to make such a sore as shall be kept discharging pus for a considerable length of time. We all know how surgeons effect this: let us inquire into Nature's mode of operating. Whether nature copies from surgeons, or surgeons from nature, we will not stop to inquire, but certain it is, that they both fix upon the same parts of the body for their operations; namely, those in which there would be the least interference offered to any animal or vital function. As Mr. Hunter justly remarks, the back part of the body is almost exclusively the seat of carbuncle. Nature effects her object then by producing the death, to a greater or less extent, of a part of the least importance in the system, and which possesses little vitality in itself, namely, the fascial covering of the muscles of some part of the back. Whilst the death of this is taking place, suppuration is established in the cellular tissue, both above and below this fascia: the pus above easily escapes, but that below must wait for the slow breaking up of the fascial texture, through which it at length gradually discharges itself, as if through a sieve, for it is prevented diffusing itself through the continuous cellular structure by the adhesive inflammation: in fine, the skin ulcerates, and portions of the fascia escape in the form of wetted whity-brown paper, until an open sore is formed, often of considerable extent, which in the course of time heals. By this local process then, and the effect it has had on the system, the phlogistic diathesis is broken down, and the patient

returns to a state of comparative health. What, then, has the surgeon to do? He may do one of two things,—either let Nature take her own course, and be content with only relieving urgent symptoms, or he may anticipate Nature's object, and render this tedious and painful process unnecessary; first, by relieving the heart, slowly, of some of its burthen, which would be best accomplished by cupping; secondly, by emptying the stomach of what may exist of crude undigested food, which is often found mixed with a tenacious glairy mucus; thirdly, by cleansing the intestinal canal of its feculent contents, consisting of the residue of the food mixed with depraved secretions; fourthly, by increasing and meliorating the secretions generally, and in such a way, and by such means, that shall least ruffle the system; and, lastly, to supply the stomach with such kind of food as will be best suited to its powers of digestion, and as will best supply the system with wholesome blood. If these circumstances are duly attended to, the local process may be cut short, in any stage, by a free incision, which must pass completely through, both in depth and extent, the inflamed or mortified aponeurosis.

These observations, however, are to be considered only to have reference to general principles; for cases frequently occur in which the exhibition of a moderate quantity of wine, or good malt liquor, may be judiciously combined with the above treatment, for the purpose of keeping up such a degree of action as may be necessary to the support of that power upon which the harmony of the whole system depends.

The Annotator is fully aware that he has broached doctrines in some of the preceding notes which are somewhat different from those generally received, in the present day, as being correct, more particularly on some important points relating to Animal and Vegetable Physiology; and he wishes it to be distinctly understood that he has so done without the most distant idea of setting the consideration of these points at rest, but rather for the purpose of laying them more open to future inquiry; for it must be allowed that, in our physiological researches, we frequently follow a phantom of our own raising, until we bring ourselves to believe in the reality of its existence. It is therefore right that we should occasionally (as tradesmen do) take stock, that we may ascertain how much, and of what kind of knowledge, we are possessed; that we may retain those facts which have stood the test of experience, and submit others which are doubtful to further investigation. On many points, perhaps, it is only truth that calls for inquiry; for practical utility it may be unnecessary: for doctrines founded on false assumptions, and which had a baneful influence on practice, are now chiefly to be met with in the records of the old schools, which were too often adopted and retained to give a gloss of precision on points in which ignorance on the part of the professors might be construed into a sin: they now fortunately are seldom to be met with in the schools of the present day, much less are they allowed to have any influence in the chamber of the sick. The good, the great, the ever memorable Cullen, who was always one of the first to enrol himself as a champion in the cause of truth, in the numerous scientific pursuits in which he was engaged, he, even he allowed himself to be ensnared into the fetters of hypothesis; and however lightly they may have sat upon him, from his numerous other resources, and however easily he could occasionally shift them, they hung, for a considerable time, with a dead weight upon many of his followers; but

"Quandoque bonus dormitat Homerus."

Thus it is that the conceptions of men of great genius, and of consequent influence, do much harm when they are the result of a departure from the strict path of logical induction.

Notwithstanding the great number of human beings who have been rescued from the grasp of death, and the still greater number whose bed of sickness, and even of hopeless recovery, have been rendered comparatively easy by the powerful aid of medicine, yet it is much to be suspected, that many may have fallen a sacrifice to the too strict adherence to false doctrines, who might have been saved, if the humble expression had been acted upon, of—I doubt.

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